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INDIAN AGRICULTURAL
RESEARCH INSTITUTE, NEW DELHI.

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EDITORIAL

THE FORTY-NINTH CONVENTION OF THE ASSOCIATION OF LAND-GRANT COLLEGES AND UNIVERSITIES

Deviating for the first time in many years from its custom of alternating its meetings between Washington and Chicago, the Association of Land-Grant Colleges and Universities returned to the National Capital for its forty-ninth annual convention, holding it in this city from November 18 to 20, 1935. This innovation was decided upon, it is understood, because of the interest of the association at this time in its Federal relationships and especially its relationships with the Federal Department of Agriculture. Not only was the formal program built directly around this theme, but the convention period was probably utilized more extensively than ever before for personal contacts and the advancement of much institutional business with the various Federal agencies.

Registration at the convention disclosed the representation of every State in the Union, as well as Alaska and Hawaii. The total number recorded was well in excess of 300, many institutions being represented not only by their presidents but by the deans of agriculture, home economics, and engineering, the directors of experiment stations and extension work, and not infrequently by other members of their staffs. Attendance at most of the sessions was large, and the subsections of experiment station and extension work and the section on home economics found it desirable to supplement the scheduled sessions with less formal gatherings before, during, and after the convention itself.

Following a brief address by Dr. Frank J. Kelly, who brought greetings from the Office of Education of the Federal Department of the Interior, the presidential address was given by President Frank L. McVey of Kentucky. President McVey took for his subject The High Obligation of the Land-Grant College and University. He traced the course of national development with its trend toward either an increased centralization or a decentralization on a regional basis, and warned the land-grant institutions of the necessity of readjustments to the new environment. This situation, in his opinion, called for sound research as the basis of the reliable information which has become so essential.

An address by Hon. Henry A. Wallace, Secretary of Agriculture, entitled The States, the Regions, and the Nation, laid down the philosophical concept of the national development of "unity out of diversity." He gave special consideration to regional planning, which he deemed one of the most significant developments of modern agriculture, and pointed out the responsibility of the land-grant institutions to provide adequate leadership and an inspiration transcending purely material values by giving greater attention to human relationships and long time objectives. Somewhat similar views, it is of interest to note, were also expressed by Mr. Edward A. O'Neal, president of the American Farm Bureau Federation, who brought greetings from that organization.

Other sessions of the convention were devoted rather specifically to discussions of the newer Federal undertakings. Dr. W. I. Myers described the work of the Farm Credit Administration in its relations to permanent sources of cooperative credit, and Mr. I. N. Gabrielson, recently appointed Chief of the Bureau of Biological Survey, outlined efforts under way to develop game management as an adjunct to agriculture under suitable conditions. Other speakers took up relationships along extension lines with the Tennessee Valley Authority, the Resettlement Administration, the Soil Conservation Service, and the Rural Electrification Administration.

The activities of the Agricultural Adjustment Administration naturally received special attention. The head of this agency, Mr. C. C. Davis, alone made three addresses, entitled The Grass Revolution; Plans, Program, and Public Opinion; and The Long-Time Program of AAA. The second of these was a part of a discussion on regional adjustment in agriculture, to which an entire session of the section on agriculture was devoted. The speakers at this session included, in addition to Mr. Davis, Secretary Wallace, Dr. H. R. Tolley, Mr. O. V. Wells, and, from the point of view of the experiment stations, Director R. E. Buchanan of Iowa.

Papers of direct interest to research were plentiful throughout the program. In the general sessions, Dr. William Charles White, chairman of the division of educational relations of the National Research Council, discussed Research in Agriculture and Culture, and Director Buchanan the practical effects of chemical research on agriculture under the title Chemistry—Friend or Foe. Directors L. E. Call of Kansas and F. B. Mumford of Missouri considered the planning and coordination of research projects before the section on agriculture. The subsection of experiment station work itself held two important sessions, the first devoted to a discussion of the topic The Roles of the United States Department of Agriculture and the State Experiment Stations in Regional Research Programs, led by Hon. M. L. Wilson, Assistant Secretary of Agriculture, and Director J. G. Lipman of

New Jersey, and the second dealing with the research program under the Bankhead-Jones Act, led by Dr. J. T. Jardine, Chief of the Office of Experiment Stations, and Director Mumford. Following the plan of recent years a more detailed discussion of these research questions will appear in the February issue of the *Record.*

The extension subsection held two sessions, dealing, respectively, with the relationship of extension to emergency programs and the subject of long-time land utilization and farm management planning. A discussion of the planning and coordination of extension projects was also given before the section on agriculture.

The subsection of resident teaching took up the improvement of instruction in the colleges of agriculture, Federal aid for agricultural students, cooperation with the educational program of the Tennessee Valley Authority, and coordinating the work of the high schools and colleges, closing with a symposium on the college curriculum. The sections on home economics and engineering also gave attention to curriculum improvement, as well as to the subjects of cooperation in research, trends in resident teaching, research, and extension teaching, and other topics of professional interest.

Many items of business were under consideration by the executive body, but its sessions were as usual held behind closed doors, and little information as to action taken is available for presentation at this time. The presidency of the association was bestowed outside the ex officio membership in the executive body by the elevation of the former vice president, Dean and Director J. G. Lipman of New Jersey. President Alfred Atkinson of Montana was elected vice president, and Dean and Director T. P. Cooper of Kentucky reelected secretary-treasurer. Dr. R. A. Pearson of Maryland, a member of the executive committee since 1916 and its chairman since 1919, was succeeded on this committee by President R. D. Hetzel of Pennsylvania, Provost A. R. Mann of Cornell University becoming chairman. A list of the section officers and committee assignments is given on page 142 of this issue.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical investigations of the U. S. Department of Agriculture] (*U. S. Dept. Agr. Yearbook 1935, pp. 150, 151, 156–159, 217, 218, 297, 298, 308, 309*).—Short notes are given under the following captions: Citrus Byproduct Uses May Greatly Influence Fresh-Fruit Market, by H. W. von Loesecke and H. H. Mottern (pp. 150, 151); Cosmetics Mostly Harmless but Sometimes Not, Tests by United States Chemists Show, by G. P. Larrick (pp. 156–159); Fruit Darkening Can Be Prevented by New Process, by A. K. Balls and W. S. Hale (pp. 217, 218); Sirup Buying from Farms by Relief Agency Shows Need for Better Quality, by E. K. Ventré (pp. 297, 298); and Starch Making from Cull Sweetpotatoes Is Placed on Commercial Basis, by H. S. Paine (pp. 308, 309).

Agricultural biochemistry (*Minnesota Sta. Bul. 319 (1935), pp. 14, 15*).—Findings since the establishment of the station on the relation of hardiness of winter wheat to the colloid behavior of the plant tissue fluid and the use of aspen wood in the production of cellulose are briefly noted.

Enzymatic hydrolysis of starch in pectic extractions from apple pomace, G. L. Baker and A. A. Horvath (*Delaware Sta. Bul. 192 (1935), p. 27*).—Results of preliminary work are briefly noted.

Experimental work on cucumber fermentation.—VIII, Genuine dill pickles: A biochemical and bacteriological study of the curing process, F. W. Fabian and L. J. Wickerham (*Michigan Sta. Tech. Bul. 146 (1935), pp. 20*).—At the beginning of a dill-pickle fermentation, Gram-positive cocci predominate. These are replaced by short rods, the majority of which are Gram-positive, and these, in turn, are replaced toward the end of the fermentation by long rods, the majority of which are Gram-positive. "Weak acid-producing bacteria predominated throughout the fermentation. The strong acid-producing bacteria reach a maximum in about 8 to 10 days after the beginning of the fermentation.

"The addition of 2 lb. of sugar per barrel increases the number of bacteria at the beginning of the fermentation. This is considered desirable since it insures a more rapid production of acid. There appeared to be no significant differences in the fermentations when hard and soft waters were used. The addition of 2 lb. of prepared mustard per barrel had no apparent influence on the fermentation. Washing the cucumbers in chlorine solution had little or no influence on the course of the fermentation. In this connection, it should be stated, however, that there are times, such as after a rain or when the cucumbers have a considerable amount of soil adhering to them, when washing would materially change the picture. In dry weather and with clean cucumbers, as in this case, the small amount of soil adhering to the cucumbers had little or no effect on the course of the fermentation. The addition of a sufficient quantity of acid, such as acetic acid, to dill-pickle brine to produce an initial pH of 4.6 is desirable according to the results obtained in these experiments."

This bulletin continues a series already noted (E. S. R., 72, p. 157).

A chemical investigation of the fermentations occurring in the process of poi manufacture, L. N. Bilger and H. Y. Young (*Jour. Agr. Res.* [*U. S.*], *51* (*1935*), *No. 1, pp. 45–50*).—Poi was found to consist of about 69 percent water, 27 percent starch, and relatively small amounts of other substances. Reducing sugars decreased rapidly in the early stages of fermentation and remained fairly constant in amount from the stage of from 12 hr. to 8 days. Starches decreased from the second to the eighth day of fermentation.

The fermentation products identified were lactic acid, acetic acid, formic acid, alcohol, acetaldehyde, and carbon dioxide.

According to the authors of this communication from the Hawaii Experiment Station, "the results of the investigation show that the fermentations occurring in poi manufacture are due primarily to the action of micro-organisms on carbohydrates."

Sugar, acidity, and juice color determinations in grapes, J. S. Shoemaker (*Ohio Sta. Bul. 550* (*1935*), *pp. 18*).—The sugar content, acidity, and color of untreated juice of 120 grape varieties growing in the vineyard at Wooster were determined in 1933 and 1934. Fruit which had been kept in low-temperature storage at —20° C. was used. Freezing the grapes facilitated the work and appeared to decrease the chances of error. The refractometer gave a measure of the sugar content more reliable than that given by specific gravity readings.

In sugar content, 20 of the 120 varieties are classified in the same group as Concord, 82 are ranked higher, and 17 are ranked lower. In acidity, 19 of the 120 varieties are grouped with Concord, 51 are more acid, and 49 are lower in acidity. It was found that "sugar, acidity, and color determinations serve to provide a measure of the quality of grapes for eating out of hand, for prepared unfermented grape juice, and for wine."

Quantitative determination of lactic acid in dairy products, H. C. Troy and P. F. Sharp ([*New York*] *Cornell Sta. Mem. 179* (*1935*), *pp. 49, figs. 10*).—This memoir describes a procedure especially developed and adapted for the determination of the lactic acid content of cow's milk and cream. The method is applicable also to whey, butter, buttermilk, dried milk, and evaporated milk, but it cannot be used for products containing sucrose.

The procedure consists essentially in the precipitation of interfering substances in one step by copper hydroxide at 45° C., direct oxidation of the filtrate with potassium permanganate after acidifying with a sulfuric acid-manganese sulfate mixture, distillation of the acetaldehyde with a large amount of water into sulfite solution, and titration of the bound sulfite with iodine. The method was found to be accurate down to 0.002 percent of lactic acid in the original milk.

In addition to an investigation of the effect of variations of procedure suggested in the literature, when applied to milk, an extensive study of the factors influencing the blank on fresh milk was carried out. This led to the development of a suitable correcting equation. It was found that the recovery of added lactic acid was incomplete because of the retention of lactic acid by the precipitate. The retention was due principally to lactose in the precipitate, and was found both to increase with the amount of lactose (or glucose) in the precipitate and to agree in behavior with the distribution of a solute between two immiscible solvents. An equation to correct suitably for the amount of lactic acid retained by the precipitate under varying conditions is given, together with the evidence justifying its use.

AGRICULTURAL METEOROLOGY

The land of your possession, I. Bowman (*Science, 82 (1935), No. 2126, pp. 285–293, figs. 6*).—This article discusses, among other things pertinent to use of agricultural lands in the United States, the relation of amount and distribution of rainfall and water and wind erosion to land use. The areas of adequate and least variable rainfall, intermediate rainfall variability, and lightest and most variable rainfall are shown graphically, and the limits of economic safety in the agricultural use of these areas under present systems of management are discussed.

It is stated that "almost with the speed and devastation af an epidemic there have overrun the world within the past decade new forces or old forces raised to new levels of power. . . . Our own Wheat Belt has experienced a revolution. The accompanying 'risk maps' show some of the physical handicaps of the region. In many sections a farm can now be bought for less than the price of the buildings—the land is thrown in as a mere situs. Wheat production on the high plains, and adjacent areas to the east and north, has been in a state of unstable equilibrium for some time, owing among other things, to the 90-day work periods of the one-crop wheat lands of the region brought into cultivation largely since 1915. When the drop in the market price of grain was followed by the severest drought of record, and widespread wind erosion followed the drought, the economic distress characteristic of the eighties and nineties was intensified, and the general problems of land use and the ultimate economic fate of the people in the area were laid on the lap of the Federal Government."

Referring to some features of man's responsibility for the present situation, the author points out that "in the area of greatest climatic and agricultural risk the protective sod has been ripped off and the soil pulverized by the repeated cultivation essential to dry farming, with the result that whole fields have taken flight."

Why the weather? C. F. Brooks et al. (*New York: Harcourt, Brace & Co., 1935, 2. ed., rev. and enl., pp. XVII+295, figs. 52; rev. in Bul. Amer. Met. Soc., 16 (1935), No. 8–9, pp. 211, 212*).—This is a nontechnical discussion of a great variety of weather phenomena, the first edition of which was published in 1924 (E. S. R., 52, p. 315). It "is based on selections from the daily newspaper notes that are syndicated under the same title by *Science Service* and were formerly prepared by the authors of the book." The book is not considered a complete or systematic treatise on meteorology, but a collection of brief self-contained articles which may be read whenever opportunity offers or for reference purposes. A good index adds to the value of the book for the latter purpose.

Weather relations in successive months studied by U. S. meteorologists, J. B. Kincer (*U. S. Dept. Agr. Yearbook 1935, pp. 336–339*).—This article explains the tendencies of certain weather characteristics, especially rainfall and warm weather, to persist for considerable periods, as illustrated by Nebraska rainfall records and Alabama, Nebraska, Ohio, and Pennsylvania temperature records. It is shown that "comparatively wet or dry, warm or cool weather, of a given month often carries over into succeeding months. Two or more months in succession rather frequently have weather of the same general character. An examination of weather records shows that this tendency is somewhat pronounced for certain weather conditions and for certain areas; but it is not generally true for different kinds of weather in any particular area nor for all areas. In fact some localities show quite as marked tendencies to opposite conditions from month to month as others do for agreement."

Weather forecasts for pest control aid citrus growers of California, F. D. Young (*U. S. Dept. Agr. Yearbook 1935, pp. 332–334*).—This article briefly explains the nature and values of the forecasts of the Weather Bureau with special reference to spraying and dusting for control of citrus insect pests and in aid of walnut growers.

Monthly Weather Review [March–April 1935] (*U. S. Mo. Weather Rev., 63 (1935), Nos. 3, pp. 79–121, pls. 10, figs. 21; 4, pp. 123–155, pls. 11, figs. 3*).—In addition to the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and bibliographical and other information, these numbers contain the following contributions:

No. 3.—Annual Variability Rainfall Maps for Nebraska, by E. E. Lackey (pp. 79–85) (see p. 8); The Hurricane Warning Service and Its Reorganization, by E. B. Calvert (pp. 85–88); Effect of the Atlantic Ocean on Temperatures in Eastern United States as Shown by Temperature-Wind Roses, by K. B. Clarke (pp. 88–91) (see below); Solar Radiation at the Scripps Institution, La Jolla, Calif., 1928–34, by B. Richardson (pp. 92, 93); The Temperatures of New England, by P. E. Church (pp. 93–98) (see below); Precipitation Trends, by E. L. Armstrong (pp. 99, 100); Weather of June as Indicating the Weather of the Following May in Idaho, by H. G. Carter (p. 101); and Dust Storms, compiled by W. A. Mattice (pp. 113–115).

No. 4.—Mathematical Theory of the Graphical Evaluation of Meteorograph Soundings by Means of the Stüve (Lindenberg) Adiabatic Chart, by L. P. Harrison (pp. 123–135); Floods in the Sacramento Valley during April 1935, by E. H. Fletcher (pp. 135–137); and Dust Storms, April 1935 (p. 148).

Rainfall intensity-frequency data, D. L. Yarnell (*U. S. Dept. Agr., Misc. Pub. 204 (1935), pp. 68, figs. 76*).—This is a compilation of data relating to rainfall intensity and frequency covering periods of from 10 to 50 years as recorded at the 206 Weather Bureau rainfall stations equipped with automatic rain gauges. "It is believed that this study has developed data sufficient for predicting with reasonable accuracy the period of recurrence of intense precipitations in any part of the United States." The data also furnish a basis for computing required capacities for drainage systems, storm sewers, culverts, etc., to safely care for excessive precipitation.

Effect of the Atlantic Ocean on temperatures in eastern United States as shown by temperature-wind roses, K. B. Clarke (*U. S. Mo. Weather Rev., 63 (1935), No. 3, pp. 88–91, figs. 5*).—A distinct and characteristic moderating effect of the Atlantic Ocean on the coastal and inland temperature of the United States in summer and in winter is shown.

The temperatures of New England, P. E. Church (*U. S. Mo. Weather Rev., 63 (1935), No. 3, pp. 93–98, figs. 4*).—It is shown graphically and in other ways that "New England is exposed to the extreme temperatures of the interior because of its position on the lee side of the continent, but these temperatures are moderated somewhat by the Atlantic Ocean. The shifting of the winds, due to the passage of high and low pressure areas, alternately brings air from over the land and ocean. The effects of the ocean often linger, thanks to the mountain barrier on the north and west.

"The climate of New England is dominated by cyclonic activity bringing frequent and marked changes in the weather. Winter is moderately long and cold with a continuous snow cover from January to the middle of March; spring comes discouragingly late; summer passes after a few brief periods of high temperatures; autumn is clear, crisp, and delightful. Precipitation is evenly distributed throughout the year. In all seasons sunny days are frequent.

"The temperatures are characterized by wide differences resulting from the latitudinal range of 6°, the moderate differences in altitude, the proximity of the Atlantic Ocean, the continental winds, and the character of the local terrain. . . .

"The great variation of the frost dates produces wide differences in the length of the growing season. Northern Maine has less than 100 days free from killing frost. In contrast, Cape Cod has more than 200 days. . . . Along the coast the growing season is at least 150 days. The best agricultural land of New England is included within the area having a frost-free season of 130 days or more. The highland areas have a short growing season because of the lower mean temperature of both summer and winter."

Annual variability rainfall maps for Nebraska, E. E. Lackey (*U. S. Mo Weather Rev., 63 (1935), No. 3, pp. 79–85, figs. 8*).—This article presents information bearing especially upon the dependability of rainfall in Nebraska as an aid to intelligent long-time planning. It is shown that rainfall variability is a factor of considerable importance in that State, especially in its bearing on planning of farm operations. "An area with a wide rainfall variability may present fewer hazards if the percentage of variability [such as that of Nebraska] is known and considered when plans for the future are being made. This variability series of rainfall maps of Nebraska may offer some possibilities in this connection that previously could not so well be taken into account."

Notes on the climate of northern Nevada, J. W. Smith (*Bul. Amer. Met. Soc., 16 (1935), No. 8–9, p. 189*).—This is a brief abstract of a paper presented at the Los Angeles meeting of the American Meteorological Society, June 26–29, 1935, dealing with characteristic features of the geography and climate of northern Nevada. It is pointed out that "the climate is not only bearable but actually enjoyable during the greater part of the year. High temperatures in summer are relatively infrequent, and these, along with the low temperatures of winter, are mitigated by the strong daily range. The climate is responsible for the sparse population, and yet it is not inhospitable. It simply does not favor agriculture, and mining is the only other important industry, unless grazing be considered apart from agriculture."

Report on the administration of the Meteorological Department of the Government of India in 1933–34, C. W. B. Normand (*India Met. Dept. Rpt., 1933–34, pp. 2+37, pls. 2; abs. in Nature [London], 135 (1935), No. 3426, p. 1070*).—This is an administrative report of the Meteorological Department of the Government of India for 1933–34. It gives the usual administrative details and meteorological data, referring especially to the success of forecasts based upon the monsoon and to the activities of the recently established branch of agricultural meteorology dealing with special researches, including studies in microclimatology and other problems affecting the welfare of crops.

SOILS—FERTILIZERS

[Soil and fertilizer investigations of the U. S. Department of Agriculture] (*U. S. Dept. Agr. Yearbook 1935, pp. 153–156, 267–269, 277–282, 305–307, figs. 2*).—Notes are presented under the following captions: Composts Are Good Means of Improving Soil of Small Farms, by C. C. Fletcher (pp. 153–156); Nitrogen Balance Sheet Shows Annual Deficit Requiring Replacement, by A. R. Merz and L. T. Leonard (pp. 267–269); Phosphate Blast Furnace Is Nucleus for Balanced Fertilizer Trade in West, by J. W. Turrentine (pp. 277–279); Phosphate Fertilizer Prepared by Treating Phosphate Rock with Steam at High Temperatures, by K. D. Jacob, B. E. Brown, and F. R. Reid (pp. 279–282); and Soil Survey Provides Data for Classifying Land—Planning Uses, by C. E. Kellogg (pp. 305–307).

[Soils and fertilizers, Alabama Station] (*Alabama Sta. Rpt. 1934, pp. 14–16, 18, 19, fig. 1*).—Results are briefly noted on the effect of the CO_2 content of the soil suspension on the pH value, by J. A. Naftel; the mechanism of phosphate retention by soils and the replacement of unavailable native phosphates in soils by silicate ions, both by G. D. Scarseth; reduction of nitrate to nitrite by green plants, by A. L. Sommer; and a study of the uniformity of soil types, by F. L. Davis.

[Soil investigations by the Delaware Station] (*Delaware Sta. Bul. 192 (1935), pp. 18–21, 25, 49–51*).—The report notes fertilizer placement tests at Newark and a study of the influence of lime on the availability of potash, both by H. C. Harris; work on the effect of fertilizers and cropping upon the nature and amount of electrodialyzable bases in the soil with particular reference to potash, by G. M. Gilligan; and the effect of copper sulfate on crops and analyses of soils for copper, both by T. F. Manns and R. Russell.

[Soil and fertilizer investigations of the Idaho Station] (*Idaho Sta. Bul. 217 (1935), pp. 7, 8, 15, 41, 42*).—Brief notes are given on soil improvement, the superiority of superphosphate to raw rock phosphate, and new methods tried in orchard fertilization.

[Soil investigations of the Minnesota Station] (*Minnesota Sta. Bul. 319 (1935), pp. 59–63*).—Results thus far obtained are briefly summarized, the topics considered including soil requirements, improvement of sandy soils, utilization of peat soils, soil moisture and soil drifting, and the forest floor and agriculture.

Soil research (*North Carolina Sta. Rpt. 1933, pp. 13, 14*).—Results are briefly noted from work on the oxidation-reduction potential of soils, by L. G. Willis, C. B. Clevenger, and J. R. Piland; the influence of potash fertilization on the iron and aluminum content of soybeans, by Clevenger and Willis; and the influence of magnesium on phosphate assimilation, by R. L. Gay and Willis.

[Soil and fertilizer studies of the Vermont Station] (*Vermont Sta. Bul. 396 (1935), pp. 18–20*).—Results are briefly noted of experiments on the injurious effects of overliming acid soils and the relation of these effects to H-ion concentration (E. S. R., 68, p. 598); on the movement and fixation of phosphates in soils (E. S. R., 70, p. 22); on losses of plant nutrients from stable manure spread on frozen ground; and on the need for and use of potassium compounds on pasture soils.

[Soil Survey Reports, 1930 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1930, Nos. 28, pp. 33, pls. 2, figs. 3, map 1; 29, pp. 35, pls. 3, figs. 2, map 1; 30, pp. 42, figs. 2, map 1; 31, pp. 18, pls. 2, figs. 2, map 1; 32, pp. 26, pl. 1, figs. 2, map 1; 33, pp. 26, pls. 2, figs. 2, map 1*).—These surveys were carried out with the cooperation of the Oklahoma, Colorado, Texas, and Kansas Experiment Stations and the Alabama Department of Agriculture and Industries.

No. 28. *Soil survey of Texas County, Oklahoma*, E. G. Fitzpatrick and W. C. Boatright.—Texas County is a tract of 1,321,600 acres in the Oklahoma Panhandle. It consists of a flat plain, of which approximately 25 percent has been dissected and eroded by the North Canadian River and its tributaries. Drainage channels have not developed, and most of the rainfall is absorbed in the soil or flows a short distance into one of the numerous depressions, where it is either evaporated or percolates downward, joining the underground water.

The survey revealed 6 soil series, inclusive of 10 types. Richfield silt loam covers 34.1 percent, Pratt fine sandy loam 18 percent, Potter fine sandy loam

13.8 percent, and Potter silt loam 12 percent of the county. Rough broken land and dune sand total 4.1 percent of unclassified material, and an eroded phase of undifferentiated Vernon soils, with a broken phase of Potter loamy fine sand, makes a further 4.3 percent classified as grazing land.

Mechanical analyses and pH determinations are included.

No. 29. *Soil survey of the Longmont area, Colorado*, A. T. Sweet and C. H. Dodson.—An area of 481,280 acres, lying in Weld and Boulder Counties, north-central Colorado, was surveyed. The lands examined lie in the extreme western and higher part of the Great Plains section. About three-fourths of the area is under irrigation.

Of the 27 soil types, here mapped and described as 13 series, Weld loam and Valentine loamy fine sand are the most extensive, occupying, respectively, 15.9 and 26.5 percent of the area examined.

No. 30. *Soil survey of Perry County, Alabama*, J. F. Stroud et al.—Perry County is an area of 462,080 acres in west-central Alabama. Most of the soils, with the exception of some of the bottom lands, are adequately drained, but "at least 40 percent of the total area is so rough and broken in surface relief as to render it unsuitable for general farming operations." The most extensive soil condition is that represented by Guin soils, undifferentiated, amounting to 23.4 percent of the county and consisting of patches of various types "so intricately mixed and so rough in surface relief that no soil type separation could be made on a small-scale map." Small areas of other soils form a total of 29 types which are here listed as 18 series. pH values are included.

No. 31. *Soil survey of Galveston County, Texas*, Z. C. Foster and W. J. Moran.—Galveston County consists of 252,800 acres in southeastern Texas. "The surface relief is that of a flat treeless prairie lying but a few feet above sea level." Of the drainage conditions it is noted that "surface dissection and erosion are almost entirely absent, the few small streams flowing in shallow channels. Large areas are so flat that water stands for a long time after rains, especially in the winter when evaporation is slow."

The soils of this area are classified as 5 series of 8 types, of which Lake Charles clay, 25.4 percent, and Harris clay, 14.0 percent, are the extensive types. Chemical analyses and pH determinations are included.

No. 32. *Soil survey of Collin County, Texas*, M. W. Beck et al.—Collin County is an area of 561,920 acres in northeastern Texas and is a part of the Blackland Prairies, in which "the dissection is shallow and somewhat incomplete." This report maps and describes 8 series, inclusive of 10 types. Houston black clay, 46.8 percent of the county, and Houston clay, of which 16.1 percent was found, cover the greater part of the county.

No. 33. *Soil survey of Neosho County, Kansas*, M. H. Layton et al.—Neosho County, southeastern Kansas, has an area of 368,640 acres and lies in the prairie plains section of the State. The Neosho River and its tributaries provide good surface drainage.

Of the 17 soil types assigned to 9 series, Parsons silt loam, which covers 29.7 percent of the area surveyed, and Summit silty clay loam, 15.2 percent, are the most important.

Soil survey of the Brighton area, Colorado, W. G. Harper et al. (*U. S. Dept. Agr., Bur. Chem. and Soils* [*Soil Survey Rpt.*], *Ser. 1932, No. 1, pp. 35, figs. 2, map 1*).—The Brighton area in north-central Colorado, surveyed with the cooperation of the State experiment station, covers 286,720 acres in Jefferson, Boulder, and Adams Counties and lies in the Plains region. There is a well-developed regional drainage.

Included in the 13 soil series found are 37 types, of which Fort Collins clay loam, 12.6 percent of the total area, and Greeley loamy fine sand, covering

9.7 percent, are among the more important agricultural soils. Mountainous rough and broken sections amount to 11.2 percent. For several soils in the area pH determinations are included.

Soil Survey of Iowa.—Report 77, P. E. Brown et al. (*Iowa Sta. Soil Survey Rpt. 77 (1935), pp. 63, figs. 23, map. 1*).—In addition to the survey data already noted in the Federal soil survey report on Washington County (E. S. R., 71, p. 449), the present report contains the data obtained in supplementary greenhouse and field experiments, together with the appendix, common to the entire series (E. S. R., 73, p. 303), on the State soil survey generally considered. The specific needs of the various soils are discussed.

Soil survey of Luce County, Michigan, J. O. Veatch et al. (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpt.], Ser. 1929, No. 36, pp. 41, figs. 2, map 1*).—Carried out with the cooperation of the Michigan Experiment Station and the Michigan Department of Conservation, this survey dealt with 581,120 acres in the eastern end of the Upper Peninsula. The main surface features are of glacial origin and include plains and terraces, representing successive stages in the levels of the glacial lakes. A considerable variety of drainage conditions was found.

Rubicon sand, Carbondale muck, and Spalding peat, occupying, respectively, 15.6, 14.5, and 9.7 percent of the area surveyed, are among the important soils. In all, 40 types of 30 series are mapped and described. An outline gives the taxonomic scheme of the soils.

Soil survey of Grant County, Oklahoma, A. W. Goke et al. (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpt.], Ser. 1931, No. 10, pp. 33, figs. 2, map 1*).—Grant County has an area of 636,160 acres abutting the Kansas-Oklahoma line. The land, in general, is smooth, consisting of small areas of undissected upland scattered throughout a region of slight but rather thorough dissection, the level areas occurring in those parts of the county where the original plain has not been encroached on by drainage ways. Most of the county depends for drainage upon the Salt Fork Arkansas River and its tributaries.

A survey in which 11 series, including 20 soil types, were noted was made with the cooperation of the State experiment station. Oswego silt loam was found to cover 22.5 percent of the county and Renfrow silt loam 15.9 percent. Eroded phases of Vernon clay loam and of Grant very fine sandy loam and Derby sand, totaling 14.5 percent, are listed as untillable.

Recommendations for the management of the soils of the county by H. J. Harper, and including chemical analyses, are appended.

Soils in relation to fruit growing in New York, VII, VIII ([*New York*] *Cornell Sta. Buls. 627 (1935), pp. 30, figs. 24; 633 (1935), pp. 22, figs. 15*).—Earlier parts of this report have been noted (E. S. R., 73, p. 782).

VII. *Tree behavior on important soil profiles in the Kinderhook, Germantown, and Red Hook areas in Columbia and Dutchess Counties*, L. P. Batjer and J. Oskamp.—Soils capable of producing the deep-rooted trees found to give large yields were, in the section under consideration, "relatively light textured, varying but slightly in the surface 4 to 6 ft., with the entire profile exhibiting a uniform brown color indicative of a well-oxidized condition." It was also observed that where a topography that favors surface run-off prevails, a heavier textured soil may be well adapted for fruit.

Depth of rooting was found usually to be limited "by one or a combination of the following conditions: (1) Bedrock, slate, or shale occurring comparatively close to the surface; this condition occurs much more frequently in the Hudson Valley than in western New York. (2) An unweathered, very compact, gravelly till substratum; this restriction to rooting invariably occurs in all glacial-till soils thus far studied throughout the fruit regions of the State, but at varying depths; in glacial-till soils classified as favorable, this unweathered till substratum usually occurs sufficiently deep to permit good rooting. (3) Imperfect drainage, due either to unfavorable topography or to slow internal drainage produced by a subsoil heavier than the surface, or to both; a high degree of mottling in the subsoil, and the development of a grayish color in the subsurface are characteristic of such soils." Other closely related observations are recorded.

VIII. *Tree behavior on important soil profiles in the Medina-Lyndonville-Carlton area, Orleans County*, J. Oskamp.—Of the value of the soil profile as an index of the capacity of a soil to support a productive orchard, it is noted that "profiles uniformly sandy in texture and of a uniform brown color in the first 2 ft. are well drained and support productive orchards. A profile of the same texture but having a well-developed gray layer and a gray and mottled subsoil is poorly drained, and orchards growing on it have a relatively low yield. Profiles containing considerable silt and clay, particularly in the lower horizons, and showing considerable grayness in the upper subsoil and mottling in the lower subsoil, may grow productive orchards if they have moderately rapid surface drainage or sufficient internal drainage so that the free carbonates have been leached out of the surface 3 ft. Profiles of the same general description but with a more highly developed gray layer, slow surface drainage, and calcium carbonate within 3 ft. of the surface develop orchards of relatively low production. Profiles of glacial-till material of moderately heavy texture in the surface 2 ft., with considerable grayness below the surface and a mottled and very compact subsoil, usually have orchards no more than average in productivity.

"While the suitability of a tract for orchard purposes can be determined with some accuracy by a field examination, it is desirable, where time and facilities permit, to apply other tests." A measure of the ground water in the spring, for example, is a single-value determination, a measurement easily carried out and one which has been found to be of much practical value.

The measurement and significance of hydroxyl-ion concentration in alkaline-calcareous soils, W. T. McGeorge (*Arizona Sta. Tech. Bul. 57 (1935), pp. 239–271, figs. 4*).—Noting the great usefulness of the pH value as an index of the productivity of alkaline-calcareous soils and the important effects of variations in analytical technic upon the results obtained in the measurement of this constant, the author records the following observations with respect to the technic of pH measurements on such soils by means of the hydrogen electrode:

"While there is a slight error involved in fineness of division of the soil sample this error can be considered negligible in routine pH determinations. The pH value is increased slightly by drying the soil in the air. The pH value varies greatly with the soil-water ratio used for the soil suspension and increases with increase in the ratio or dilution. The increase in pH value with soil-water ratio is most rapid below 1:10, which suggests that for practical purposes and convenience a 1:10 soil suspension is most suitable.

"The same kind of water should be used in all pH determinations if results are to be comparable. This applies especially to the carbon dioxide content of the water. It is necessary to boil the water to assure freedom from carbon dioxide. Careful attention to the partial pressure of carbon dioxide is probably the most important precaution which must be taken in the determination of pH value of alkali soils.

"The determination of pH value should be made at a definite time after the soil suspension is prepared. The pH decreases with the increase in the length of the time interval between preparing the soil suspension and making the determination.

"It is recommended that the pH determination of alkali soils be made after standing 24 hr. Maximum pH values for alkali soils are obtained by using carbon dioxide-free water, 1 part soil to 10 parts water. Minimum pH values for alkali soils are obtained by reducing the hydrolysis of clay compounds and the ionization of electrolytes by adding soluble salts to the soil suspension."

A method of estimating the pH value of alkali soils, in which the maximum pH is determined by using carbon dioxide-free distilled water in a 1 : 10 soil suspension and the minimum pH by adding 10 cc each of 2 M NaCl and 2 M $CaCl_2$ solutions to 50 cc of a 1 : 10 soil suspension, is proposed.

A barium-fluorine study: The fate of added barium silicofluoride and its effect upon sulfates and other soil components, as influenced by limestone and by dolomite, W. H. MacIntire, W. M. Shaw, and B. Robinson *(Tennessee Sta. Bul. 155 (1935), pp. 31, figs. 4)*.—A detailed description of a 4-yr. lysimeter study of the chemical behavior of and biological influences exerted by barium and fluorine in additions as $BaSiF_6$, intended "to determine the effects upon (1) supplies of soil sulfates, (2) biological end products, (3) exchange reactions, fate, and ultimate combinations induced by single and replicated additions, and (4) any divergent effects exerted upon the foregoing by supplements of limestone and of dolomite", is given.

"From the barium data obtained by the several methods of attack, it was concluded that no barium was leached; the reaction between the added salt, or its hydrolytic derivative, BaF_2, and the soil sulfates gave marked decreases in immediate sulfate content through formation of $BaSO_4$; the barium not immediately reactant with SO_4 was absorbed by the soil complex in exchange for H, but not for Ca, Mg, or K; the adsorbed, or fixed, barium hydrolyzing slowly into solution from the soil complex accounted for the prolonged depressions in sulfate outgo; about one-half of the fixed barium was held in the 'exchangeable' state and the rest as 'unexchangeable', in the accepted sense of those terms.

"The findings as to ultimate fate of added fluorine, the formation of CaF_2, except when vitiated by dolomite-derived MgF_2, were considered to show a common fate of all fluorine additions and hence to insure a low fluorine solubility in the soil system. The repressive effect that supplemental calcium salts exert upon CaF_2 solubility in the soil are considered to obviate any cumulative toxic effect from increments derived from dusts and sprays of fluorine materials and from CaF_2 introduced by additions of phosphatic fertilizers."

The use of sugar beet petioles as indicators of soil fertility needs, R. Gardner and D. W. Robertson *(Colorado Sta. Tech. Bul. 14 (1935), pp. 16)*.—In seeking a method capable of indicating accurately the phosphate requirements of calcareous, often alkaline, soils, the authors compared the potassium carbonate soil test (E. S. R., 69, p. 328) with the method dependent upon the determination of phosphate in the petioles of beet leaves, described below. The petiole test was found to be much the more efficient for the detection of differences in available phosphate brought about by manure treatments, and "seemed to be sufficiently accurate to give a reliable indication of phosphate needs of the soil."

The method for determining phosphate, nitrate, and potassium in the beet leaf petioles is thus described: "Each sample of petioles was placed in a bunch on a block and enough thin cross-section slices shaved off to make a 2-g sample. The sample was placed in 20 cc of distilled water, shaken 2 or 3 times at intervals, and allowed to stand 12 or 24 hr. For the phosphorus determination, 1 cc of solution was drawn off and diluted sufficiently so that the color could be read in a Hellige comparator. In most cases, 1 cc of the solution to 20 cc of water gave about the required dilution. The color was developed by adding 3 drops of molybdate solution, followed by 1 drop of stannous chloride solution. The reading was taken when the color approximated the maximum intensity, which was usually within 30 sec. The molybdate solution was prepared by dissolving 25 g of ammonium molybdate in 200 cc of water at 60° C., and adding to 800 cc of sulfuric acid prepared by diluting 28 cc of arsenic and phosphorus-free concentrated sulfuric acid. The volume finally was made up to 1,000 cc.

"The stannous chloride solution was prepared by dissolving 25 g of $SnCl_2 \cdot 2H_2O$ in 100 cc of concentrated HCl and making up to 1,000 cc. . . .

"The nitrate and potash tests were made on portions of the extract diluted to the desired concentrations. . . . Thornton's rapid procedure [E. S. R., 69, p. 780] was followed for the potash tests, using an aliquot of the extract as in the phosphate and nitrate tests." Nitrate was determined by means of the diphenylamine-sulfuric acid color reaction.

A comparison of the effects of applications of treble superphosphate and manure on the composition of the plant extracts indicated that manure much more efficiently increased the available phosphorus.

[Experiments with fertilizers, lime, and manure] (*Ohio Sta. Spec. Circ. 46 (1935), pp. 53–90, fig. 1*).—Tables show the effect of various fertilizer and liming treatments and of various soil reactions upon yield and return in a number of rotations. Very brief supplementary statements are appended to the tables, and the crop valuations and costs for fertilizers and liming materials, upon which the return calculations are based, are given.

Availability of the phosphoric acid of finely-divided rock phosphate, G. S. Fraps (*Texas Sta. Bul. 509 (1935), pp. 16*).—The availability of the phosphoric acid in soft phosphate with colloidal clay in 7 pot experiments was found to vary from 0 to 120 with an average of 40, as compared with the phosphoric acid of superphosphate taken as 100. The availability was low on the slightly basic soils and high on one acid soil, although it was not high on all of the acid soils. The phosphoric acid of soft phosphate with colloidal clay had, in general, an availability to plants much lower than that of the phosphoric acid of superphosphate, and its availability seemed to be lower on neutral or basic soil. In 5 pot experiments the availability of the phosphoric acid of finely ground rock phosphate was only about 40 percent of that of superphosphate. Its availability seemed to be low on neutral or basic soils and high on acid soils. On some acid soils, the availability of the phosphoric acid of both soft phosphate with colloidal clay and finely ground rock phosphate was equal to that of superphosphate, but on other acid soils its availability was decidedly less than that of superphosphate. The results on the same soils were similar whether the availability was measured by the relative gain in weight of the crop or by the quantity of phosphoric acid taken up by the plant.

Field experiments with phosphates, C. F. Noll, C. J. Irvin, and F. D. Gardner (*Pennsylvania Sta. Bul. 315 (1935), pp. 14, figs. 2*).—Twelve yr. of the quadrennial rotation corn, oats, wheat, and mixed clover and timothy hay, the fertilizers being applied in the corn and the wheat years, indicated that "on this soil phosphorus is the limiting element. Where it was omitted, applications of nitrate of soda and muriate of potash gave little increase in yields. When phosphorus was applied with nitrogen and potash the heaviest applications of 16 percent superphosphate and 32 percent rock phosphate, 450 and 600 lb., respectively, gave the largest yields and the highest net returns. When applied with 6 tons of manure also, the largest profits were realized from these high applications.

"Basic slag, bone meal, superphosphate, and rock phosphate were compared when applied at rates equivalent to 300 lb. of 16 percent superphosphate, with nitrate of soda and muriate of potash added. The comparative yields were in the order given. These phosphates, with the exception of bone meal, also have been applied with 6 tons of manure. On limed land, the rank in yield was basic slag, superphosphate, and rock phosphate. Applied with manure on unlimed land, basic slag did not give significantly higher yields than superphosphate. The relative yields from rock phosphate were not significantly higher on unlimed land than on limed. As compared with superphosphate, the rock phosphate plats were not more productive as the experiment progressed.

"Both gypsum and flour of sulfur increased the yields from the rock phosphate plats when they were applied with nitrate of soda and muriate of potash. Twenty lb. of nitrogen in nitrate of soda (equivalent to approximately 130 lb. of nitrate) applied with superphosphate and muriate of potash apparently increased the yields of wheat slightly, but not the yields of corn. Where muriate of potash was applied with the other commercial fertilizers, 150 lb. gave larger yields and higher net returns than 50 lb. or 100 lb.

"The difference in results from plowing down rock phosphate or superphosphate, as compared with applying them on the surface of plowed ground and harrowing them in, was hardly significant.

"The importance of supplementing manure with a phosphate is shown very clearly."

Commercial fertilizers, H. R. KRAYBILL ET AL. (*Indiana Sta. Circ. 212* (*1935*), *pp. 75, fig. 1*).—In addition to the usual tabulation of the analytical data for the fertilizer inspection of the year 1934, this circular contains a table of classified fertilizer sales in Indiana since 1883, showing the changes in fertilizer types of the 52-yr. period, together with related information.

Analyses of commercial fertilizers, B. F. ROBERTSON (*South Carolina Sta. Bul. 304* (*1935*), *pp. 48*).—The usual analyses are given for the 1934–35 fertilizer inspection.

Commercial fertilizers, L. S. WALKER and E. F. BOYCE (*Vermont Sta. Bul. 397* (*1935*), *pp. 23*).—The bulletin contains the usual analytical information from the 1935 inspection. With but one exception, all of the 114 brands licensed were of the "high analysis" type, containing 14 percent or more of total plant foods.

AGRICULTURAL BOTANY

Limitations of Blackman's law of limiting factors and Harder's concept of relative minimum as applied to photosynthesis, B. N. SINGH and K. N. LAL (*Plant Physiol., 10* (*1935*), *No. 2, pp. 245–268, figs. 9*).—This is the first of a series of papers on photosynthesis in tropical plants. Preliminary to the analysis of growth in terms of assimilation and respiration, this paper attempts to elucidate the relationship between the external factors—light, temperature, and carbon dioxide—and photosynthesis, with special attention to the concentrations and the intensities in which they interact under ordinary natural conditions in the subtropics. From these studies, confined mainly to wheat, flax, and sugarcane plants, and in which the rate of photosynthesis was determined by the continuous current methods of F. F. Blackman, the following results were obtained:

Under low light intensities the curves showing the relationship between carbon dioxide and photosynthesis were smooth, and the stationary phase was absent or extended to only a small range. With higher light intensities the curves in wheat and flax were also extremely regular, though there was a high range in the stationary phase with increasing carbon dioxide concentrations, the toxic effect not being so easily marked.

The carbon dioxide concentration giving maximum readings depended on light intensity, the higher optimum following the higher light intensity. These results are probably correlated with the greater availability of energy under the higher light intensities. Beginning with 0 percent of carbon dioxide, the rate of photosynthesis increased with increase of carbon dioxide until the respiratory output balanced the assimilatory intake.

The light requirements of different crops vary. This is probably related to the nature of the end products formed.

Raising the temperature accelerated the photosynthetic rate, this increase resulting from the joint accelerating and depressing effects of the temperature. The readings showed an increase in rate until the former effect was greater than the latter, an optimum being reached when the two balanced each other. The time effect was earlier at higher temperatures. The optimum for wheat and flax lay at a lower temperature than for sugarcane, probably due to their greater adaptability toward temperature.

Under any one set of conditions the photosynthetic rate is governed by at least two factors. Whether the concentration of carbon dioxide was high or low under high light intensities, the rate was always controlled by light. The theory of relative minimum proved to be limited in application, partially holding good under very low light intensities and carbon dioxide concentrations. Any relationship found between external factors alone, without considering the internal changes in the process and the intensities in which the external factors reach the internal tissues, will not hold good under all circumstances.

Investigation on the effect of age on assimilation of leaves, B. N. Singh and K. N. Lal (*Ann. Bot. [London], 49 (1935), No. 194, pp. 291–307, figs. 6*).—In this second paper of the series, the method used was the determination of the photosynthetic rates of the leaf population, segregated into classes (juvenile, adolescent, and senescent), at successive stages throughout the life cycle of wheat, flax, and sugarcane under optimum conditions of light carbon dioxide temperature, and water to exclude any limitations due to external variables. Under these conditions the changes in photosynthetic rates thus became a function of the internal factors. The results of the study were as follows:

The age-assimilation data for mature leaves in these three crop plants under optimum conditions yielded a characteristic curve with a low value while the plants were young, a maximum when they showed maximum growth and maturity, and a slowing down with age until photosynthesis ceased toward the senescent stage. Under a reduced carbon dioxide concentration, equivalent to that of the air, this curve merged into a level phase in which the initial values were maintained throughout the life cycle, indicating that under natural conditions carbon dioxide limits both photosynthesis and plant growth.

Besides the water and chlorophyll content, the presence of presumed catalysts, such as calcium and potassium, apparently governs the photosynthetic intensity. When there were no other limiting factors, the greater the amount of these " catalysts ", the greater was the photosynthetic intensity.

At any phase of the life cycle, changes in the developmental stages of the leaves were followed by variations in their photosynthetic rate, the young leaves showing high, the mature leaves medium, and the old leaves low photosynthetic rates. A chronological or morphological classification of the leaves proved to be no criterion of their photosynthetic activities, since before and after a definite age of the plants all of the leaves were more or less of one physiological type. The age and developmental stage of the leaves was found to be an important internal factor in the control of both the intensity and the mechanism of photosynthesis.

Photosynthetic behaviour of leaves to variations in temperature, B. N. Singh and K. Kumar (*Indian Acad. Sci. Proc., 1 (1935), No. 11, Sect. B, pp. 736–753, figs. 4*).—This third paper of the series reports the results of laboratory studies of the leaves of the radish of the variety Behra-Sindhora Newar grown in the field under favorable soil and natural air conditions at the Institute of Agricultural Research, Benares Hindu University.

The daily march of assimilation in a young leaf for 20 days (the period of physiological activity as determined for a radish leaf in the laboratory) was deduced from the separate time-assimilation curves of mature and old leaves. Under the natural carbon dioxide pressure of the air, photosynthesis in radish leaves increased continuously up to 29° C. in general conformity with Van't Hoff's law, 2.26 being the coefficient of increase. The maximum photosynthesis attained under these carbon dioxide relations was reached at 30°. At from 30° to 34° the first observed value of photosynthesis attained was of the same order, but at and above 30° this initial value abated in successive hours. While the first evidence of the time factor was available at 30°, its pronounced effect was not shown until 37° was attained, when the disparity between the first and the second hourly readings was striking. At 29° a higher sustained pitch of photosynthesis was reached by increasing the partial pressure of carbon dioxide. Photosynthetic activity in radish leaves stopped at 47.4° and did not commence at a temperature below 12.6° in this tropical region. This behavior is contrasted with that of cherry-laurel as reported by G. L. C. Matthaei (1904) working in temperate regions, who found the threshold of photosynthesis to be —6°. This difference is ascribed to the ecological adaptation of plants to the higher temperatures of the tropical regions.

The reactions of the assimilatory system to alterations of light intensity, B. N. Singh and K. Kumar (*Indian Acad. Sci. Proc., 1 (1935), No. 11, Sect. B, pp. 754–762, fig. 1*).—In this fourth paper of the series further results with radish leaves are reported, the general experimental procedure and location being the same as in the preceding study and an electric light and a temperature of 29° C. being used. At the normal carbon dioxide pressure of the air the intensity of photosynthesis increased measurably with the increase in light intensity up to 68,760 meter-candles. At 10 times the atmospheric concentration the rate continued to increase with the increase in light intensity up to 72,197 meter-candles. Depression in the photosynthetic activity appeared to occur first at a light intensity of more than twice the average sunlight of the winter months in this subtropical region. An appreciable time factor set in at a light intensity of 180,000 meter-candles. This depression in photosynthetic rate appeared to be connected with the inactivation of the chloroplasts and was capable of reversal under reduced light intensity, provided that exposure to the higher light intensity had not been too prolonged. The threshold of light intensity for photosynthesis was around 4,000 meter-candles. The minimum and optimum cardinal points here found, though characteristic for the subtropics, would not necessarily apply to the temperate regions where the plants are adapted to lower intensities of light.

The influence of partial pressure of carbon dioxide on photosynthetic efficiency, B. N. Singh and K. Kumar (*Indian Acad. Sci. Proc., 1 (1935), No. 12, Sect. B, pp. 909–927, figs. 3*).—In this fifth paper of the series, the general technic of the previous contributions was followed, using "type leaves" of radish.

The photosynthetic rates, with varying percentages of carbon dioxide, were studied under three light intensities both above and below that of the solar radiation under natural conditions, and with temperatures at optimum values under which the time factor seemed to have no marked influence on the rate. With increased carbon dioxide concentration the photosynthetic rate rose up to a certain range of the intensity factor, after which the curves of this relationship showed a stationary level phase, sooner or later followed by a decline.

Under increased light intensity the curves showed a steep rise with characteristically different contour from those under low light intensity. The range at which carbon dioxide toxicity occurred also increased with increased light. Leaves subjected to very high carbon dioxide concentrations are probably poisoned, but this toxicity can be reduced if the concentration in the surroundings is lowered. Radish leaves appeared to offer a small resistance to the toxic action of high concentrations, and hence the declining phase of photosynthesis was obtained at sufficiently low percentages of carbon dioxide.

A strict proportionality between carbon dioxide concentration and photosynthetic rate was outside the range of the observations. The relationship of carbon dioxide concentration seemed to be more direct with the apparent than with the actual assimilation. The direct proportionality, if any, seemed to hold true more for the low concentrations of short range, i. e., of the order of from 0.04 to 0.15 mg of carbon dioxide per 100 cc. The curves indicating the carbon dioxide: photosynthesis relationship conformed neither with the typical limiting factor curves of F. F. Blackman (1905), having a sharp angle at the point of change of the limiting factor, nor with the smooth rounded curves of Harder (E. S. R., 49, p. 127) or of [P.] Boysen-Jensen (1918). They appeared rather to take an intermediate position in this respect.

The light and temperature-photosynthesis curves recall the fact that the photosynthetic rate is capable of increase on increase of any of the conditioning factors present and below the limiting value. Thus, photosynthesis is apparently not governed rigidly by Blackman's law of limiting factors or by Harder's theory of relative minimum.

From the practical standpoint an ideal environment for the highest growth and yield of radishes was formulated. These ideal conditions for growth were suggested on the basis of the concentration of external variables at which radish leaves can give the maximum photosynthetic rate for a sufficient time. The adaptability range of the plants to the environmental complex in which they grow was also elucidated.

On the orientation of stomata, G. E. Smith (*Ann. Bot.* [*London*], *49* (*1935*), *No. 195, pp. 451–477, figs. 15*).—This study was undertaken to elucidate the factors determining the orientation of the stomata, especially of the leaves. These factors may be related to the morphology of the organ on which they occur or to the physiology of its development. The results furnish evidence of a marked correlation in many leaves between the direction of the long axes of the stomata and that of the underlying vascular tissue.

Using young and old leaves of *Sambucus nigra* and *Ficaria verna*, the orientation of the stomata parallel to the veins was shown to be characteristic of those differentiated earlier, while a more irregular orientation often resulted for those developed later.

In the two pairs of periclinal chimeras examined, the stomatal orientation was more like the "vein parent" than the "skin parent."

The author concludes from a variety of evidence presented that even in net-veined leaves, where the relationship is not immediately apparent, there is often a correlation between stomatal orientation and vein direction. It is further suggested that the stresses set up in the epidermis, due to differences in the rate of development of the bundle and mesophyll tissues on the one hand and of the epidermis on the other, may be important factors in determining stomatal orientation.

Transpiration and pressure deficit, I, II, F. M. HAINES (*Ann. Bot.* [*London*], *49* (*1935*), *Nos. 194, pp. 213–238, figs. 3; 195, pp. 521–565, figs. 7*).—In this series of studies an attempt is made to investigate the relation between transpiration rate and pressure in the conducting tracts, or rather the pressure deficit, by direct experiments.

In part 1, apparatus and preliminary experiments, the rates of water absorption by branches of various plants placed in potometers were followed, the upper parts of each branch being enclosed in a metal cylinder (here described) with a glass window for illumination and the leaves exposed to increased pressures. Increases in pressure always decreased the rates of absorption, and vice versa. At sustained pressures above the atmospheric the rate was at first reduced, but later it recovered to some extent toward the original atmospheric pressure rate. On reduction or release of pressure there was a disproportionate increase in the absorption rate, which soon fell toward the original level. The actual absorption rate at any pressure was found to depend not only on the pressure but also on the previous history of the branch with respect to recent deficits.

On theoretical grounds the effects are probably due partly to alterations in leaf cell volume and partly to alterations in transpiration rate. These studies indicate the correct methods for determining the relative roles played by these two factors.

The parallelism with the effects of pressure deficits under natural conditions is discussed, but the full interpretation of the results is deferred.

In part 2 the results are given of systematic experiments on gradually increasing and sustained constant pressure deficits in which the absorption rates of cut branches of *Acer*, *Aesculus*, etc., the upper parts of which were enclosed in a pressure cylinder, were measured by ascertaining the rates of penetration of eosin solution.

With increasing pressures the absorption fell off with pressure, the decrease being most rapid at first and later less so, until absorption finally ceased and the direction of flow was reversed. On the other hand, the reduction of pressure led to an enormous increase in absorption rate. At constant pressure above the atmospheric the absorption rate was reduced considerably at first, but "recovered" toward the original rate. Recovery is shown to be due to the cessation with time of the mechanical compression of the leaf cells. This makes for a downward flow of water until the cells have reached their reduced equilibrium volumes under the increased pressure. There was no reexpansion of the cells before the pressure was again lowered, and no increase in osmotic pressure beyond that due to the decrease in volume. After from about 0.5 to 1 hr. under constant pressure, the absorption rate became constant at a level depending on the pressure used. The higher the pressure used, the lower was the percentage of the original rate reached.

The final constant rates thus obtained under different pressures are shown to be measures of the rates of transpiration under these pressures, so that the transpiration rate can be plotted against pressure. Increase of pressure deficit thus decreases the transpiration rate, such reduction being relatively greatest at the lower deficits. After the first reduction, transpiration is for a time less affected by further increases of deficit until a final falling off of transpiration sets in. The deficit is also shown to increase the resistance to flow offered by the walls or protoplasts of the leaf cells.

The author points out a fallacy in the application of Ohm's law to problems of conduction, and briefly discusses the bearing of his results on the effects of deficits in nature and on the resistance to droughts.

Influence of certain sulfate-hydrated lime mixtures on transpiration, J. D. Wilson and H. A. Runnels (*Ohio Sta. Bimo. Bul. 175 (1935), pp. 143–146, fig. 1*).—Continuing studies already referred to (E. S. R., 73, p. 625), it was found that the sulfates of nickel, iron, and manganese in combination with hydrated lime and water caused nearly as great an increase in the transpiration rate when applied to coleus as did bordeaux mixture. With tomato shoots, mixtures containing zinc, ammonium, and potassium sulfate were found to be considerably less effective in this respect than those containing sulfates of copper, nickel, iron, and manganese. The precipitates of these various mixtures settled in the reverse order of their effectiveness in increasing the transpiration rate.

Influence of various sulfur-containing fungicides on transpiration, J. D. Wilson and H. A. Runnels (*Ohio Sta. Bimo. Bul. 175 (1935), pp. 146–148*).—Continuing the studies referred to in the foregoing abstract, 18 sulfur-containing spray materials were applied to coleus plants in an effort to determine their relative effect on the transpiration rate. Liquid lime-sulfur plus hydrated lime and Kolofog, which contains a high percentage of bentonite, were the only materials tested which caused an increase in transpiration in any way comparable to that of bordeaux mixture, and these increases were not more than from one-third to one-half as great as that caused by the latter material. Dry lime-sulfur and liquid lime-sulfur caused an increase in transpiration over that from untreated checks of more than 50 percent during the night period. All other materials tested were below this, and, with the exception of lime-sulfur plus lime and Kolofog, the increase in transpiration during the 24-hr. period was less than 8 percent. Hence the authors consider it unlikely that any injury from sulfur-containing spray materials can be due to an excessive increase in transpiration.

The effect of nutritive state on the quantity of vitamin A present in the leaves of Coleus blumei, E. S. Haber and P. P. Swanson (*Jour. Agr. Res. [U. S.], 51 (1935), No. 1, pp. 75–81, fig. 1*).—Since several authors had reported no evidence of cross transfer of mineral nutrients within the plant, this study at the Iowa Experiment Station was undertaken to determine whether there is a cross transfer of vitamin A within the plant. Vitamin A was not synthesized in as large quantities in a poorly nourished, stunted coleus plant as it was in an actively growing, well nourished one. However, when differentiated growth was induced in two sides of a single plant, the leaves of the underdeveloped lateral contained relatively as much vitamin as did those on the luxuriantly growing branch. These findings suggest either a specific but unidentified nutrient factor essential for the synthesis of vitamin A or a cross transfer within the plant of potential vitamin A materials in a manner that is not characteristic of the food factors essential for the growth of a plant.

Response of the woody plants Hibiscus syriacus, Malvaviscus conzattii, and Buginvillea glabra to length of day, H. A. Allard (*Jour. Agr. Res. [U. S.], 51 (1935), No. 1, pp. 27–34, figs. 5*).—An investigation of the woody plants shrub-althea (*H. syriacus*), turkscap hibiscus (*M. conzattii*), and bougainvillea (*B. glabra*) was made to determine their length-of-day requirements favorable to flowering at Washington, D. C. The plants of the three species used were grown, respectively, from seed, cuttings, and young hotbed plants, and the flowering responses were noted for lengths of day of 10, 12, 12.5, 13, 13.5, 14, and 14.5 hr., and for the normal length of day (15 hr.). Shrub-althea behaved as a long-day plant, flowering on a lengthened day and for all exposures above 12 hr.' The turkscap hibiscus flowered in response to all lengths of day and is indeterminate in its flowering response. Bougainvillea flowered on a shortened length of day, flowering being induced by a 12-hr. daily exposure and heavy under 10 hr. of daylight.

The usefulness of these plants as ornamentals depends as much on their particular day-length responses as on any other factor.

GENETICS

Maternal inheritance of chlorophyll in sorghum, R. E. Karper (*Jour. Heredity, 25 (1934), No. 2, pp. 49–54, figs. 2*).—The two types of striped plants, green and yellow and green and white, described in this contribution from the Texas Experiment Station, appeared independently in various cultures of sorghum and were found to be transmitted only through the female. Variegated plants gave normal green, striped, and yellow or white progeny in accordance with the location of the parent seed in relation to the chlorophyll pattern of the panicle. The green plants produced green progeny, yellow or white seedlings died, and striped plants repeated the behavior of the parent. Flowers from a panicle area lacking chlorophyll produced only yellow or white progeny, whether self-fertilized or pollinated with pollen from a normal plant. Normal flowers, fertilized with pollen from the chlorophyll-deficient area, gave only normal plants.

Genetics and animal breeding, C. Kronacher (*Handbuch der Vererbungswissenschaft, edited by* E. Baur and M. Hartmann. *Lief. 20 (III, E), Genetik und Tierzüchtung. Berlin: Borntraeger Bros., 1934. No. 20 (III, E), pp. VII+280, figs. 61*).—This is a presentation of the knowledge of the mode of inheritance of characters in horses, cattle, sheep, goats, rabbits, and birds, together with suggestions for further research.

Apparent changes with age in crossing-over between colour and size genes in mice, C. V. Green (*Jour. Genet., 30 (1935), No. 1, pp. 101–106*).—Attention is called to data on the cross between *Mus musculus* and *M. bactrianus* (E. S. R., 72, p. 602), in which it is pointed out that changes in the values of the brown-black mean weight ratios in the back-cross populations support the view that crossing over between size and color genes increases with age in the female and decreases in the male.

Headdot: An incompletely recessive white spotting character of the house mouse, C. E. Keeler (*Natl. Acad. Sci. Proc., 21 (1935), No. 6, pp. 379–383, fig. 1*).—Studies are reported on the inheritance of headdot, a type of headspotting occurring in the house mouse without white on the belly. Results from a series of matings suggest that the character is incompletely recessive to the normal. Its appearance was irregular both in the homozygous and heterozygous condition.

Studies of the linkage of headspot with the hairless character, while somewhat suggestive, were found to be too meager for positive results.

Other crosses showed that one female carried 2 genes for Berlin blaze (a modified form of piebald or a piebald allelomorph) and 1 for headspot, proving that headspot is not an allelomorph of recessive piebald.

Linkage studies of the rat (Rattus norvegicus), H. D. King and W. E. Castle (*Natl. Acad. Sci. Proc., 21 (1935), No. 6, pp. 390–399*).—A series of linkage tests revealed two linkage systems in the rat, one containing the genes *C* for the albino allelomorphic series, *p* for pink-eyed yellow, and *r* for red-eyed yellow, while the other system contained the genes *B* for black and *Cu* for curly. Independent segregation was found between curly and the genes *A* (agouti), *C*, and *h* (hooded). No linkage was found between the gene *B* and the genes *A*, *C*, and *h*, or between *Cu* and *D* (dilute). The gene *k* (kinky) was inherited independently of *A*, *Cu*, and *h*.

Other crosses showed that no linkage existed between the genes *k*, *A*, and *h*. Independent segregation was indicated between the genes *Cu* and *hr*.

Milk goat breeding, L. H. ADDINGTON and O. C. CUNNINGHAM (*New Mexico Sta. Bul. 229 (1935), pp. 81, figs. 17*).—Data are reported on the milk and fat production of native does mated in successive generations to purebred Toggenburg bucks. The 8 native does used as foundation animals produced an average of 522.2 lb. of milk and 26.14 lb. of fat. The production was increased in successive generations of grading up to the Toggenburg to an average of 1,505.2 lb. of milk and 56.16 lb. of fat for the does that were $\frac{15}{16}$ Toggenburg. The inbred daughters produced by mating some of the 3 bucks with their own daughters produced less in each case than their dams. Twenty-two purebred Toggenburg does produced an average of 1,488.7 lb. of milk and 55.96 lb. of fat.

Studies of the inheritance of horns and wattles substantiated the conclusion that horns are inherited as in cattle—due to a simple recessive gene—whereas wattles were dominant and considered to be due to the operation of a single gene. However, matings of heterozygous wattled parents produced 130 wattled to 60 nonwattled progeny.

Data are also included on the fertility of the does. Does over 18 mo. of age produced more than 2 kids per pregnancy. About 1.5 kids per pregnancy were produced by does under 18 mo. of age. The mean length of 144 gestation periods was approximately 150 days.

In 1,450 milkings the average rate was 77.2 lb. per hour.

Wrytail is a heritable defect in Jersey cattle (*Idaho Sta. Bul. 217 (1935), p. 23*).—Study of the pedigree of a herd of Jersey cattle, in which wrytailed individuals appeared in three consecutive generations, showed the character to be definitely heritable. It appeared to behave as a single-factor case in which wrytail was recessive to the normal.

Genetics of abnormal growth in the guinea pig, S. WRIGHT (In *Cold Spring Harbor Symposia on Quantitative Biology, II. Cold Spring Harbor, N. Y.: Biol. Lab., 1934, vol. 2, pp. 137–147, figs. 5*).—A discussion of the genes controlling morphological characteristics in the guinea pig, with special reference to hair whorls, polydactyly, and otocephaly.

A mutation of the guinea pig, tending to restore the pentadactyl foot when heterozygous, producing a monstrosity when homozygous, S. WRIGHT (*Genetics, 20 (1935), No. 1, pp. 84–107, figs. 5*).—Continuing the studies of the inheritance of polydactyly in the guinea pig (E. S. R., 73, p. 166), breeding experiments with a stock which produced a mutation exhibiting vestiges of little toes, thumbs, and one big toe indicated that this condition was due to the influence of a semidominant gene (*Px*). It was further determined that the litters from *Px* × *Px* parents were about one-fourth smaller than other litters. Monsters occasionally appearing were considered to be homozygous *PxPx* progeny, but most of these normally died and were resorbed before birth.

The homozygotes found showed as many as 44 nails on individual animals, there being as many as 12 nails on one foot. Matings of homozygotes produced 69 normals and 90 polydactyls. As a 1:2 ratio would be expected on the hypothesis suggested, evidently some genotypical polydactyls appear as normals.

Studies of the birth weights and mortality of the heterozygotes showed them to be slightly more vigorous than normals of the same stock.

Crosses with a stock characterized by well developed little toes due to multiple modifying factors different from *Px* produced practically 100 percent little toes and thumbs in the heterozygotes.

Two hereditary types of hydrocephalus in the house mouse (Mus musculus), F. H. CLARK (*Natl. Acad. Sci. Proc., 21* (*1935*), *No. 3, pp. 150–152*).—In attempting to determine whether the American and German types of hydrocephalus, which have been found to occur in the house mouse, are due to the same gene or to different genes, crosses were made between animals heterozygous for each type. There were produced from this cross 65 normal mice with no hydrocephalics, indicating rather definitely that the two types are not the same, since a 3:1 ratio of normals to hydrocephalics would be expected in case a single gene was involved.

Types of subnormal development of the head from inbred strains of guinea pigs and their bearing on the classification and interpretation of vertebrate monsters, S. WRIGHT and K. WAGNER (*Amer. Jour. Anat., 54* (*1934*), *No. 3, pp. 383–447, pls. 6, figs. 3*).—A description is given of the anatomy of various types of otocephalic monsters observed in the guinea pig, with a discussion of the genetic interpretation of otocephaly which has been largely noted heretofore (E. S. R., 73, p. 165).

Further contributions on the blood group relations in cattle [trans. title], C. KRONACHER, F. HOGREVE, and R. HUNDSDÖRFER (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 29* (*1934*), *No. 3, pp. 425–445*).—Additional studies of blood groups in cattle[1] indicated that incubation temperatures of about 20° to 25° C. seemed most suitable for the agglutination work. From immunization experiments on rabbits, a fourth blood group was found in cattle. There were, however, only about 2 or 3 percent of the cattle in this group.

A suggestion of a relation between the blood group and milk and fat production was also offered.

Conditions of hypertrophy of the seminal vesicles in rats, [I], II (*Biochem. Jour., 27* (*1933*), *No. 5, pp. 1438–1450, pl. 1; 28* (*1934*), *No. 4, pp. 1360–1367, fig. 1*).—In the first of these papers a discussion is given by J. Freud of the characteristics of the seminal vesicles in the castrated rat and their response to administration of the sex hormones. This is followed by a comparison of the response of the capon and the rat to male hormone administration.

Purification of the male hormone resulted in a loss of potency as measured by rat tests, while full activity, as measured by capons, was retained.

An increased action of the combination of male and follicular hormones on the seminal vesicles is noted.

In part 2, The Effect of Derivatives of Oestrone (Menformon), by K. David, J. Freud, and S. E. De Jongh, results are given of a study of the action of estrone on various organs, including the preputial glands, seminal vesicles, prostate, and periurethral tissue of immature castrated male rats.

The response of the gonads of immature pigeons to various gonadotropic hormones, H. M. EVANS and M. E. SIMPSON (*Anat. Rec., 60* (*1934*), *No. 4, pp. 405–421*).—Results are reported on studies of the capacity of gonadotropic substances to stimulate growth of immature pigeon testes as compared with the effects on the ovaries of immature rats.

Intramuscular injections of approximately 1 rat unit of extracts of sheep and pig pituitary into squabs from 30 to 33 days of age for 4 successive days increased the size of the testes six times as compared with controls. Growth of the ovaries of females was not stimulated unless as much as 10 rat units was administered.

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[1] Contributions to the knowledge of blood groups in cattle [trans. title], G. Lodemann. Ztschr. Züc͏ht., Reihe B, Tierzücht. u. Züchtungsbiol., 27 (1933), No. 2, pp. 207–219.

Hypophyseal extracts at the level giving synergic effects in rats (E. S. R., 73, p. 28) when combined with prolan seemed devoid of gonadotropic effects in this species.

In other tests it was found that menopause prolan, in several times the dose necessary to stimulate detectable effects on the rat ovary, did not stimulate a response in the testes of pigeons, suggesting a difference between the pituitary hormone and menopause prolan. Urine from a person with an embryonic carcinoma of the testicle gave a similar result. An extract of the endometrium of a pregnant mare was much less effective in stimulating growth in the pigeon testes than in the ovaries of the immature rat.

The results of the above test on the sensitivity of squab's testis to gonadotropic hormones obtained from the anterior hypophysis, and the failure of the mixture of prolan and hypophyseal synergist, suggest that the latter combination of substances is not identical with the anterior hypophyseal hormone. The tests further indicate that the results with the pigeon testes do not parallel the results obained with immature rat ovaries.

The effect on male rats of the simultaneous administration of male and female sexual hormones and the relation to the assay of the hormones, V. Korenchevsky and M. Dennison (*Biochem. Jour., 28 (1934), No. 4, pp. 1486–1499*).—Studies were made of the influence of subcutaneous administration of preparations of testicular hormone alone or in combination with estrin, on 73 castrated rats for 7 and 21 days. The results showed that the use of estrin with the testicular hormone greatly increased the weight of the seminal vesicles and caused only slight, if any, increase in the weight of the prostate, penis, and preputial glands. It is suggested that the percentage change in the weight of the prostate be used in the assay of the hormone which promotes comb growth, and that change in the weights of the prostate and seminal vesicles, together, be used for the assay of the whole male sexual activity resulting from sex hormone preparations.

Changes in other organs resulting from the administration of the sexual hormones are also discussed, including the amount of change in weight of the prostate and seminal vesicles by 1 rat unit of the hormone.

On the assay and the absorption of testicular hormone dissolved in oil, V. Korenchevsky, M. Dennison, and A. Kohn-Speyer (*Biochem. Jour., 27 (1933), No. 3, pp. 778–782*).—Studies with 15 castrated rats showed that the injection of a testicular hormone over a period of 7 days gave more pronounced effects on the size of the prostate and penis than injections over a 4-day period and examination 3 days later, suggesting that the hormone was completely absorbed in the oil solution.

The effect of testicular hormone on normal sexually mature rats. A method of biological assay, V. Korenchevsky, M. Dennison, and A. Kohn-Speyer (*Biochem. Jour., 27 (1933), No. 5, pp. 1506–1512*).—Data are reported on the influence of injections of the testicular hormone on the various organs of 37 normal adult male rats.

The influence of testicular hormone on cryptorchid rats, V. Korenchevsky, M. Dennison, and A. Kohn-Speyer (*Biochem. Jour., 27 (1933), No. 3, pp. 783–785*).—The influence of testicular hormone injections on the testes, prostate, seminal vesicles, penis, and thymus of rats, in which cryptorchidism was artificially produced, is reported. By comparing treated animals with controls it was considered that the treatments had a slight inhibitory effect on the development of the prostate and seminal vesicles, and probably on the testes. Involution of the thymus was slightly accelerated.

Simultaneous administration of testicular hormone with antuitrin and prolan or with desiccated thyroid, V. Korenchevsky, M. Dennison, and A. Kohn-Speyer (*Biochem. Jour., 27 (1933), No. 5, pp. 1513–1516*).—The administration of testicular hormone to castrated rats caused increases of from 123 to 532 percent in the weights of the prostate and seminal vesicles. No certain significant additional influence accompanied the simultaneous administration of the hormone with antuitrin S and prolan.

The application of the Kober test to the quantitative estimation of oestrone and oestriol in human pregnancy urine, S. L. Cohen and G. F. Marrian (*Biochem. Jour., 27 (1934), No. 4, pp. 1603–1614, figs. 7*).—Data are presented to indicate that estrone and estriol in human pregnancy urine may be quantitatively determined with a reasonable degree of accuracy by a colorimetric reaction, the procedure for which is presented in detail.

Mass excretion of oestrogenic hormone in the urine of the stallion, B. Zondek (*Nature [London], 133 (1934), No. 3354, pp. 209, 210*).—Quantitative studies of the estrogenic hormone in the urine of 4 stallions showed that approximately 1,700,000 mouse units were excreted per day. Other studies showed that the amount of the hormone produced by pregnant mares per day was 1,000,000 mouse units, whereas the nonpregnant mare produced only 2,000. Less than 0.3 percent of the amount of the hormone was present in the urine of the gelding as compared with the stallion. These results suggest the testes as the source of the hormone. Extracts made from two testes of a stallion indicated the presence of 23 100 mouse units, showing that this is the richest tissue known containing estrogenic hormone.

The males of other Equidae, such as the zebra, ass, and kiang, were also found to produce large amounts of the estrogenic hormone.

The urine of the stallion was not found to be especially rich in the gonadotropic hormone, prolan, and corpus luteum hormone.

The effect of oestrone on normal and castrated male rats, V. Korenchevsky and M. Dennison (*Biochem. Jour., 28 (1934), No. 4, pp. 1474–1485*).—Studies were made of subcutaneous injections of pure crystalline estrone on 39 normal and 73 castrated rats. Continued doses decreased gains in body weight, depressed development of the sexual organs in normal animals, and increased the weights of the seminal vesicles, prostate, penis, preputial glands, and hypophysis in castrated animals. Changes in the size of the other organs of the body are also noted.

The effect of prolactin on the estrus cycle of nonparous mice, I. Dresel (*Science, 82 (1935), No. 2121, p. 173*).—In studying the effect of prolactin on the estrous cycle, observations were made on 30 mature young nonparous female mice, of which 14 with regular cycles were injected with 1 bird unit of prolactin daily over a period of 30 days. Estrum was suspended during the following 20 to 25 days, but reappeared and was markedly prolonged after that period, suggesting that the suspension of the estrous cycle during lactation is caused by the pituitary hormone prolactin.

On the thermostability of prolan, F. A. Askew and A. S. Parkes (*Biochem. Jour., 27 (1933), No. 5, pp. 1495–1497*).—Tests of the influence of temperatures on the stability of prolan showed that the ovulation-producing capacity was retained after heating to 100° C. for 1 hr. in the dry state, but it was quickly destroyed at a temperature of 100° in an aqueous solution.

The effect of theelin on the mammary rudiments of male mice differing in susceptibility to tumor development, W. U. Gardner, A. W. Diddle, E. Allen, and L. C. Strong (*Anat. Rec., 60 (1934), No. 4, pp. 457–475, pls. 3*).—Subcutaneous injections of from 1 to 5 rat units of theelin daily for 15 to 147 days in male mice of three different strains stimulated development of the mammary gland for 60 to 75 days. However, not all of the glands were necessarily developed, as frequently the third pair could not be found in the males.

Hypophysectomy of the cat, M. K. McPhail (*Roy. Soc. [London], Proc., Ser. B, 117 (1935), No. 802, pp. 45–63, pls. 5, figs. 3*).—A method of hypophysectomizing cats is described and the effects of the operation on the animals noted. Post-mortem examination of the hypophysectomized cats (9 nonpregnant, 4 pregnant, and 3 lactating) showed that hypophysectomy resulted in atrophy of the gonads and accessory sex organs in both males and females, and stopped milk secretion in the lactating animals.

Hypophysectomy of birds, IV, V, R. T. Hill and A. S. Parkes (*Roy. Soc. [London], Proc., Ser. B, 117 (1935), No. 804, pp. 202–218, pl. 1, figs. 5*).—Continuing the series of studies on hypophysectomy of birds (E. S. R., 73, p. 462), the following papers are reported:

IV. *Plumage changes in hypophysectomized fowls.*—Hypophysectomy of 3 cocks and 2 hens was found to result in a complete molt within from 2 to 4 weeks. The new feathers showed a loss in black pigment and a lack of barbules resulting in a fringing. The results were similar to those which follow thyroidectomy, and because of the fact that thyroid deficiency follows hypophysectomy in mammals, it is considered that the changes are due to the resulting thyroid deficiency.

V. *Effect of replacement therapy on the gonads, accessory organs, and secondary sexual characters of hypophysectomized fowls.*—The administration of an anterior pituitary extract to hypophysectomized males tended to retard the atrophy of the testicles which followed hypophysectomy, but spermatogenesis was not maintained and the comb soon atrophied. This indicates that the internal secretory activity of the testes was not maintained. The loss of black pigment and the lack of fringing in the feathers appeared exactly as in the uninjected birds.

Attempt was made to restore spermatogenesis by the administration, over a period of 8 days, of more than 5,000 rabbit units of gonadotropic substance obtained from horse pituitary, with essentially negative results. However, some slight activity was evidently stimulated. Results of attempts to restore the atrophied ovaries and combs were also comparatively unsuccessful, although the color of the comb was temporarily improved.

The black pigment was restored in the new breast feathers by daily doses of 1 mg of crystalline thyroxine.

The comb of a hypophysectomized cock showed a slight response to the administration of the male hormone, but not to estrone.

The endocrine factors concerned in the control of the ovarian cycle.—I, Xenopus laevis as a test animal, C. W. Bellerby (*Biochem. Jour., 27 (1933), No. 3, pp. 615–620*).—Tests of the use of the South African clawed toad for the diagnosing of pregnancy (E. S. R., 72, p. 172) showed that the toad proved sensitive, gave a quick and reliable response, and the same animal could be used over successively for the test.

Polyovular follicles in the cat, P. H. Dederer (*Anat. Rec., 60 (1934), No. 4, pp. 391–403, pls. 3*).—Serial sections of the ovaries of a cat showed the presence of 27 biovular follicles, 15 triovular, and 3 follicles with 5 ova. No abnormalities except the large number of ova were observed in the development of the follicles. It appeared that the polyovular follicles arise from the failure of the connective tissue to grow between the ova.

The problem of distinguishing the sex of day-old chicks, W. C. Thompson and L. M. Black (*New Jersey Stas. Circ. 358 (1935), pp. 20, figs. 13*).—A brief review is given of the determination of the sex of chicks at hatching by the use of sex-linked characters, and a description of the Japanese method of determining the sex of chicks at hatching by the presence or absence of the rudimentary copulatory organ in the vent of the newly hatched chick.

FIELD CROPS

[Field crops research by the U. S. Department of Agriculture] (*U. S. Dept. Agr. Yearbook 1935, pp. 198–202, 286–289, 311–313, 315–317, figs. 5*).—Features of recent agronomic research are described in brief articles entitled Fineness and Maturity Are Important Elements in Cotton-Fiber Quality, by R. W. Webb and C. M. Conrad (pp. 198–202); Rice When Treated for Milling Acquires Desirable Qualities, by J. W. Jones and J. W. Taylor (pp. 286–289) (E. S. R., 73, p. 315); Sugarcane Crossed with Sorgo Gives Seedlings Potentially Valuable, by E. W. Brandes (pp. 311–313); and Tobacco of High Quality Produced Following a Natural Weed Fallow, by J. E. McMurtrey (pp. 315–317) (E. S. R., 72, p. 43).

[Agronomic research in Alabama, 1934], R. Y. BAILEY, J. M. ROBINSON, D. G. STURKIE, E. V. SMITH, G. L. FICK, and J. F. DUGGAR (*Alabama Sta. Rpt. 1934, pp. 12–14, 17, 18, 24–26, 30*).—Progress results are again (E. S. R., 73, p. 29) reported for field crops experiments dealing with nitrogen sources in a 2-yr. rotation with corn and cotton; sources and rates of nitrogen for oats; rate of fertilizing cotton with and without poisoning for bollweevil; effect of moisture and fertilizers on lint development in cotton; the time of planting of carpet, Dallis, and Bermuda grasses; wild onion control with creosote-kerosene spray; the germination, longevity, and control of nutgrass; and observations on dissimilar nodulation following the planting of unhulled and shelled seed of winter legumes.

[Agronomic experiments in Idaho, 1934] (*Idaho Sta. Bul. 217 (1935), pp. 12–15, 16, 44, 45, 46, 48, 49–51*).—Research with field crops (E. S. R., 72, p. 34) reported on from the station and substations included breeding work with wheat, barley, oats, corn, Ladino and red clover, alfalfa, sweetclover, and slender wheatgrass; variety tests with oats, winter and spring wheat and barley, alfalfa, red clover, field peas, potatoes, and miscellaneous forage grasses and legumes and mixtures; variety date-of-planting tests with spring wheat and oats; cultural (including planting) trials with wheat, alfalfa, and potatoes; prevention of drill injury to field peas (E. S. R., 72, p. 764); seed bed preparations for different crops; fertilizer tests with alfalfa, clover, and potatoes; treatment of alfalfa with sulfur and gypsum; and crop rotations.

[Results of agronomic research in Minnesota] (*Minnesota Sta. Bul. 319 (1935), pp. 25–30, 51, 70, 71, 73, 74, 75, 78*).—The major accomplishments in field crops research, indicated in these pages as derived by the station since its establishment, were obtained in breeding work with corn, wheat, barley, oats, rye, flax, sweet corn, sunflowers, and potatoes; variety tests and fundamental research including genetic and plant physiology investigation, all supplementing the crop improvement studies; trials of forage crops and mixtures; cutting, winter hardiness, and rotation experiments with alfalfa; variety, nurse crops, green manuring, and root development studies with sweetclover; fertilizer tests with potatoes and crops in rotation; crop rotations; and weed control by herbicides and cultivation. Varieties of merit developed or introduced by the station are noted.

[Field crops research in North Carolina, 1932–33], C. B. WILLIAMS, H. B. MANN, R. E. CURRIN, JR., W. H. RANKIN, J. W. HENDRICKS, S. C. CLAPP, C. DEARING, J. L. REA, JR., E. G. MOSS, J. F. BULLOCK, J. J. SKINNER, R. J. HARRIS, P. H. KIME, J. G. POLLOCK, J. H. MOORE, R. E. STUTTS, G. K. MIDDLETON,

R. E. Stitt, M. E. Gardner, and R. Schmidt (*North Carolina Sta. Rpt. 1933, pp. 16–22, 26, 27–32, 35, 37, 38, 40–43, 70–72, 74, 75*).—Experimentation with field crops (E. S. R., 70, p. 762) reported on from the station and substations included variety tests with cotton for yield and wilt resistance, corn, wheat, oats, barley, soybeans, alfalfa, red clover strains, peanuts, potatoes, and tobacco; breeding work with cotton, wheat, oats, barley, potatoes, and soybeans; inheritance studies with cotton; cultural (including planting) tests with corn, sweetpotatoes, and peanuts; intercropping of corn and soybeans; effects of certain dusts and sprays on growth and yield of peanuts; tobacco experiments concerned with fractional applications and placement of fertilizers, fertilizer and lime requirements in rotation, nitrogen sources, and the effects on yield and quality of crop rotation and of preceding soybeans; fertilizer experiments with cotton, involving phosphorus carriers, organic: inorganic nitrogen ratios, concentrated fertilizers and methods of applying them, and placement studies; cotton fiber investigations dealing with effects of source and care of seed, physical properties of lint of improved varieties, and the effects of different fertilizer formulas and erosion; cultural needs of corn and soybeans in rotation, and the form and rate of lime for corn, both on muck soil; fertilizer mixtures for potatoes and sweetpotatoes; the yields and quality of different field crops when grown in variously fertilized and limed rotations on several soil types; and comparison of phosphorus sources for different crops in rotation. Certain investigations were in cooperation with the U. S. Department of Agriculture.

Handbook of experiments in agronomy (*Ohio Sta. Spec. Circ. 46 (1935), pp. 101, figs. 2*) —Resembling an earlier publication (E. S. R., 67, p. 517) in scope, this circular tabulates the results of variety and cultural (including planting) tests with corn, wheat, oats, barley, soybeans, alfalfa, sweetclover, red clover, and grasses; comparisons of flax varieties for seed, and corn hybrids v. varieties; trials of spring cereals, flax, and field peas, separate and in mixtures, for grain, of summer annual forage crops, of soybeans with corn and with Sudan grass, and of crop combinations for hay; cutting tests with alfalfa, clover, and sweetclover; harvesting tests with corn; tillage studies; crop rotations; and lawn experiments including time and rate of seeding, establishment of turf on surface soil and subsoil, turf maintenance with observations on roots and rhizomes of Kentucky bluegrass; peat moss mulch, and a method for determining when to water lawns. Experiments with fertilizers, lime, and manure (pp. 53–90) are noted on page 14. Certain experiments were in cooperation with the U. S. Department of Agriculture.

[**Field crops research at Rothamsted, 1933**] (*Rothamsted Expt. Sta., Harpenden, Rpt., 1933, pp. 20–31, 36, 37, 43–50, 56–59, 69–72, 95–114, 116, 118–147, 159–196*).—Agronomic experiments (E. S. R., 72, p. 35), reported on again from the station and outlying fields, included fertilizer studies with wheat, barley, potatoes, sugar beets, mangels, kale, brussels sprouts, and grassland; a comparison of manure with nitrogen carriers for crops; organic v. artificial fertilizers; fertilized rotations; seed bed preparations and meadow v. fallow for wheat; inoculation of legumes; cultural tests with sugar beets, barley, kale, and potatoes; and trials of forage mixtures. Summaries of station contributions on statistical methods and plat technic are included, together with a paper (pp. 43–50) by R. A. Fisher on The Contributions of Rothamsted to the Development of the Science of Statistics.

[**The Woburn field experiments, 1933**], J. A. Voelcker (*Rothamsted Expt. Sta., Harpenden, Rpt., 1933, pp. 50, 51, 85–94, 115, 117, 148–155*).—Yields in the fifty-seventh year of continuous wheat and barley on Stackyard field are again reported (E. S. R., 72, p. 35), with accounts of crop rotations, green manuring experiments, fertilizer experiments with barley, sugar beets, and brussels sprouts, inoculation experiments with alfalfa, and cultural tests with sugar beets.

Fertility rotation experiments, G. L. Schuster and C. E. Phillips (*Delaware Sta. Bul. 192* (*1935*), *pp. 15, 16*).—Yields in a rotation of corn, soybeans, wheat, and clover and timothy, treated with various fertilizer, lime, and manure combinations, and yields from various fertilizer and lime treatments on corn grown continuously, are reported for the years 1929–32, inclusive.

Yarding systems and crop rotations for poultry farms, H. B. Sprague (*New Jersey Stas. Circ. 357* (*1935*), *pp. 12, figs. 2*).—Practical information is given on the double yarding system, soil management and cultural practices, crop varieties and seeding rates, and on rotations, and the growing of corn, wheat, rye, alfalfa, and clover for feed and litter.

Fertility and soil reaction in turf production, D. Moses (*So. African Jour. Sci., 31* (*1934*), *pp. 288–298, pl. 1*).—Three more years of work on this study (E. S. R., 67, p. 235), including several new treatments, led to the conclusion that under the experimental conditions the question of soil fertility surpasses that of soil reaction. Provided phosphates, potash, and lime, along with liberal quantities of nitrogen, are applied, the dominant grass *Cynodon dactylon* can thrive over a reaction range from extremely acid to very alkaline.

The influence of reseeding and fertilization on growth and composition of pasture and hay plants (*Vermont Sta. Bul. 396* (*1935*), *p. 20*).—Brief notes are given on the response of Kent wild, native wild, Ladino, and common white clover on three major soil areas fertilized and unfertilized, and on the merits of strains of native wild clover.

Summer fallowing, its meaning and management [trans. title], A. Åslander (*K. Landtbr. Akad. Handl. och Tidskr., 73* (*1934*), *No. 5, pp. 492–538, figs. 7; Eng. abs., pp. 534, 535*).—Several experiments are reported in which summer-fallowing, especially ridge fallow, was featured by control of perennial weeds. Increased cereal yields after ridge fallow were attributed to nitrate accumulation, which was in proportion to the weed growth on the land before fallowing. On soil free from perennial weeds, nitrate accumulation usually was not affected by intensity of cultivation. Fallowing did not appear to influence the amount of readily available potassium or phosphorus. In one test the moisture-holding capacity of the soil increased with intensity of cultivation. The merits and practical aspects of the practice in Scandinavia are discussed, and 89 references are listed.

A search for factors determining winter hardiness in alfalfa, C. R. Megee (*Jour. Amer. Soc. Agron., 27* (*1935*), *No. 9, pp. 685–698*).—Results in Michigan Experiment Station studies made to find factors usable in the laboratory to predict relative winter hardiness showed that the relative degree of injury to alfalfa roots by low temperature was indicated by electrical conductivity. No direct relationship was evident between winter hardiness and heat of wetting, swelling, moisture equivalent, freezing point, chemical composition, respiration, and amount and rate of loss of moisture in roots of hardy and nonhardy alfalfas. Citing the behavior of succeeding generations of Hardigan, Grimm, Utah common, and Arizona common alfalfa in transmitting different degrees of winter hardiness, the author concludes that heredity is the most plausible explanation of winter hardiness. Currently, field tests aided by electrical conductivity tests are deemed necessary for determining the relative winter hardiness of different lots of alfalfa.

The decrease in yielding capacity in advanced generations of hybrid corn, N. P. Neal (*Jour. Amer. Soc. Agron., 27* (*1935*), *No. 8, pp. 666–670*).—Examination of the yields of F_1, F_2, and F_3 generations of a number of single, 3-way, and double corn hybrids grown at the Wisconsin Experiment Station showed that the grain yield of the parent lines of hybrids averaged from 37 to 39 percent of that of the F_1 generations, while F_2 and F_3 generations of single hybrids averaged, respectively, 70.5 and 75.7 percent. The yield of F_2 generations of double hybrids averaged 84.2 percent of the F_1 generation. In the 3-way hybrids, the F_2 and F_3 generations averaged, respectively, 76.6 and 75.8 percent as much as the F_1 generation. The standard, locally-adapted, open-pollinated variety in the trial yielded 53.1 bu. per acre. The F_2 generation of the double hybrids averaged about the same as the variety and the 3-way hybrids almost 4 bu. less. The results demonstrated that in corn dissipation of the excess vigor of hybrids over the parent inbred lines probably is in accord with the simple genetical rule of Wright (E. S. R., 48, p. 469).

The adaptation of corn to climate, D. F. Jones and E. Huntington (*Jour. Amer. Soc. Agron., 27 (1935), No. 4, pp. 261–270, figs. 2*).—The view that corn varieties cannot be removed from their places of origin and adaptation without loss of productiveness was not supported by experimental results cited in this contribution from the Connecticut [New Haven] Experiment Station. Study of yields of corn when moved from one to another locality in relation to the average yields in different regions led to the deduction that corn may be moved from a less favorable to a more favorable climatic region without loss of productive capacity, and usually with distinct gain, provided the length of the growing season permits satisfactory maturity. Conversely, most of the loss in productivity when seed corn is taken from one region to another is held to be due to less favorable conditions of climate.

The adaptation of corn to climate, H. B. Sprague (*Jour. Amer. Soc. Agron., 27 (1935), No. 8, pp. 680, 681*).—Principles developed above are discussed in regard to results obtained by the New Jersey Experiment Stations (E. S. R., 67, p. 127).

Further comments on adaptation of corn to climate, D. F. Jones and E. Huntington (*Jour. Amer. Soc. Agron., 27 (1935), No. 8, pp. 682, 683*).—A reply to Sprague.

Influence of nutritional balance upon the development of corn plants, G. H. Duncan (*Ill. State Acad. Sci. Trans., 23 (1931), No. 3, pp. 143–148, fig. 1*).—When pure-line or selfed corn, growing in sand cultures at the University of Illinois, was supplied with nutrient salts in different proportions, an excess of nitrogen and phosphorus accompanied a reduced efficiency by the plant to take up these elements, a tendency not shown with excess potassium. Deficiencies in nitrogen and phosphorus resulted in more efficient use of the available amounts of these elements, while a low supply of potassium accompanied its poor utilization. High nitrogen produced stocky and sturdy plants with good yields and normal root : top ratio, while low nitrogen resulted in tall, slender, late-maturing plants with a relatively high root : top ratio. High phosphorus produced almost normal plants, but low phosphorus resulted in a poor, late-maturing top growth with nearly normal root growth. High potassium produced very large plants with a relatively extensive root growth and low potassium a small top growth and very limited root growth.

Efficiency of ammoniated superphosphates for cotton, J. T. Williamson (*Jour. Amer. Soc. Agron., 27 (1935), No. 9, pp. 724–728*).—In 185 fertilizer experiments with cotton, made on different soil groups by the Alabama Experiment Station, average yield increases due to phosphorus were greatest on the Highland Rim and Appalachian Plateau soil groups and least on the Greenville soil group of the Coastal Plain. Relative increases due to different phosphorus carriers on all except the Greenville group agreed with the relative increases in the average of all experiments which, with the increase due to superphosphate as a basis, were for superphosphate, 100; ammoniated superphosphate (2 percent N), 100; ammoniated superphosphate (4 percent N), 90; and precipitated tricalcium phosphate, 85. Ground limestone used with complete fertilizer containing superphosphate and 4 percent ammoniated superphosphate, respectively, produced average increases of 53 and 16 lb. of seed cotton per acre.

Lespedeza in Illinois, J. J. Pieper, O. H. Sears, and F. C. Bauer (*Illinois Sta. Bul. 416 (1935), pp. 297–347, figs. 21*).—The varieties of lespedeza and their histories and adaptations; the merits of the crop for pasture, hay, seed, soil improvement and conservation, and its place in rotations; its soil, fertility, and culture and harvesting requirements; and weeds and insect pests and diseases are discussed in detail from results of experiments since 1922 on experimental fields on different soil types throughout Illinois.

Lespedeza's value as a hay and pasture crop, relative acid tolerance, drought resistance, relative freedom from insect and disease pests, and low seeding cost place it definitely in Illinois agriculture. The crop is best adapted to the southern half of the State. It is resistant to drought and heat but is sensitive to freezing weather in early spring and late fall and yields best where there is at least a moderate moisture supply. Its special value lies in ability to grow and produce a good stand where alfalfa, red clover, and sweetclover will not thrive.

Korean appeared in general to be the most desirable annual variety, although under some conditions Tennessee 76, Kobe, and common may be preferable. In northern Illinois, Harbin is the only commercial sort expected to produce enough seed for self-seeding. The perennial *L. sericea* showed promise as a hay crop in most of the southern half of the State. While lespedeza grows more satisfactorily on poor and acid soils than most other legumes suitable for pasture, it does best on productive, well-drained, nonacid soils. When the crop is grown for the first time, thorough inoculation is indicated in the northern three-fourths of the State and is often profitable in southern Illinois. Lespedeza responded markedly to limestone on acid soils and also to phosphorus and potassium on soils low in these elements. Although lespedeza is used most widely for pasture, either alone or in mixtures, it makes a good quality of hay that compares favorably with alfalfa in chemical composition, palatability, or in meat and milk production. Where well adapted, it serves as green manure and protects against soil erosion.

History of potato varieties, W. D. Davidson (*[Irish Free State] Dept. Agr. Jour., 33 (1935), No. 1, pp. 57–81*).—Outstanding varieties introduced into Ireland since Rye published his list in 1730 are considered.

Locality in relation to seed-potato production, A. W. Hudson and J. W. Woodcock (*New Zeal. Jour. Agr., 50 (1935), No. 2, pp. 98–106, fig. 1*).—Districts producing seed giving rise to crops relatively high in yield and low in virus infection were those which, by reason of latitude or altitude had cooler climates than the district supplying the other lines under trial.

Greensprouting seed potatoes, E. V. Hardenburg (*[New York] Cornell Sta. Bul. 632 (1935), pp. 29, pls. 5, figs. 2*).—Greenhouse and field studies, 1928–31, were made to determine some of the principal effects of greensprouting of seed potatoes on subsequent plant growth and yield. The White Rural and Green Mountain varieties were used.

Greensprouting was found to promote earliness of emergence and a more rapid and early growth of both foliage and tubers, to result generally in fewer stems per plant, to increase both stolon number and stolon weight per plant, and in general to increase the number of tubers per stem. Greensprouting did not seem to affect stand of plants or subsequent root development in the potato. The most important economic result was the fact that yield per acre of marketable-sized tubers was increased significantly by greensprouting owing to the cumulative effect of the earlier plant development, resulting in tuber setting under optimum conditions of temperature and soil moisture, and of an increased tuber set. The increase in yield due to lengthening the greening period beyond 2 weeks was not enough to justify the extra risk and expense.

In associated depth-of-planting tests, 2-, 4-, and 6-in. depths, respectively, averaged 238.4, 242, and 230 bu. of U. S. No. 1 tubers per acre; 3.07, 2.80, and 2.93 stems per plant; and 2.18, 2.22, and 2.12 tubers per stem. A planting depth of from 2 to 4 in. is indicated for growers in regions with similar soil and rainfall conditions.

Uniformity trials with rice, C. L. Pan (*Jour. Amer. Soc. Agron., 27 (1935), No. 4, pp. 279–285*).—The merits of randomized and systematic arrangements of replicated plats were compared, and the comparative efficiency of plats of different sizes was studied in three uniformity trials at Hangchow and Wufu in Chekiang Province, China, involving different varieties.

The single-row plat was generally more efficient than any other size except the two-row plat of the Hangchow medium-maturing rice, which was about 9 percent more efficient than the single-row plat. Increase in width of plat was comparatively more efficient than increase in length of row in the Hangchow experiments, but an opposite result was obtained with the Wufu late-maturing variety.

In the randomized arrangement, the number of differences in yield between all possible comparisons of hypothetical varieties that fell within 0.5 times standard error, 1 times standard error, and so forth, was computed. Satisfactory agreement between observed numbers and mathematical expectation was obtained at Hangchow, but at Wufu P was less than 0.01. With the systematic arrangement, deviations from mathematical expectation were too great to be explained on the basis of random sampling.

Harvesting soybeans for hay, C. J. Willard, L. E. Thatcher, and J. B. Park (*Ohio Sta. Bimo. Bul. 175 (1935), pp. 148–154, figs. 4*).—Cutting and curing experiments showing trends in yield, protein content, and curing in relation to maturity and weather conditions led to the suggestion that soybean hay ordinarily should be cut by September 1 in northern Ohio and by September 10 in southern Ohio. When cut early in the season in good curing weather, soybeans may be cured most economically if left in the swath until well wilted and then placed with the side delivery rake in small windrows to be turned once or twice. Late in the season, soybean hay usually must be cocked for a satisfactory product, but it should first be cured in swath and windrow as much as the weather permits. Curing soybeans in bundles has been extremely unsatisfactory at the station. Observation, trained by experience, is deemed the only practical guide to storing soybean hay, but the beans in the pods must be fairly hard for safe storing.

Some principles of competition as illustrated by Sudan grass, Holcus sorghum sudanensis (Piper) Hitch., F. de Peralta (*Ecol. Monog., 5 (1935), No. 3, pp. 355–404, figs. 16*).—Sudan grass (planted May 22) was grown on level, deep, fertile sandy loam soil during the dry, hot summer of 1933 in University of Nebraska studies. Its life history as determined under the normal planting rate, the effects of competition under different planting rates, and behavior of plants under different heights of cutting are reported in detail. Competition was measured in plats 25×40 ft. under a normal (N) planting rate (22 lb. of seed per acre), 2N, 3N, ½N, and ¼N rates. Differences in height were not marked until rapid stem elongation occurred about July 1. As the plants were less crowded, they were more able to manufacture materials for stem growth, hence they became increasingly taller from the 3N to the ¼N plats. The same relationships attained throughout the entire period of development in regard to length, width, and area of leaves, diameter and area of stems, number of tillers, size of panicles, dry weight of tops, and number and depth of roots.

Water losses from large insert phytometers were greatest both per unit area and per plant with increased thinness of planting. Losses per unit area of green leaves were greatest in the thinner stands during the seedling stage but later became greater in the thicker plantings. Competition for available soil water was most severe in the thickest planting and progressively less so to the thinnest. Water was a chief limiting factor for growth; the degree of plant development was in direct relation to the amount of available water. Light ranged from 23 to 60 percent from the thickest to the thinnest plantings when the plants were about 46 in. tall but from 11 to 32 percent when they had attained full height. Relative humidity decreased with thinness of planting, whereas evaporation increased.

The yields of cured hay per acre in order of thickness of planting were (¼N) 3.25, 3.96, 4.5, 4.44, and (3N) 4.22 tons, respectively, or with the N yield considered as 100 percent, they were 72, 88, 100, 99, and 94 percent. When plats of each planting rate were cut 6 times at 2- and 6-in. heights, maximum partial yields from 2-in. cuttings were from the 2N or N plantings; while those from 6-in. cuttings varied widely. After the first clippings, subsequent yields were greatest from those clipped high. Repeated cutting of tops caused parent stalks to die and stimulated tillering, plants cut closely tillering most. Extent of root development was correlated with extent of tops. Total yields decreased as a result of clipping 6 in. high, from 3N to ¼N, 39, 40, 37, 33, and 34 percent, and with 2-in. clipping 72, 68, 69, 72, and 71 percent, respectively.

Seed production of space-isolated vs. bagged mother beets and a discussion of some factors influencing the latter, H. L. Kohls (*Jour. Amer. Soc. Agron., 27 (1935), No. 9, pp. 699–706*).—Seed production studies with sugar beets, 1930–33, carried on by the Michigan Experiment Station in several localities, included comparisons of space isolation v. bagging, and considered types of bags, size of isolator, shading, shaking, and climate. It was observed that much more seed could be obtained from mother beets isolated by space than by bagging, although this advantage is offset by the longer time required for space isolation, danger of bad weather preventing isolation until warm weather, which decreases the number of beets sending up seed stalks, danger of crossing with Swiss chard or garden beets, or destruction by careless individuals. Seed production under bags per mother beet can be increased by placing several bags on each mother beet, using thin and large bags, shaking bags daily during the flowering period, not shading the bags, and possibly by growing the mother beets in a cool section of the State. See also earlier notes (E. S. R., 71, p. 627; 72, p. 471).

A general summary of experiments with sugarcane.—I, Work of the Sugar Experiment Station, W. G. Taggart, C. B. Gouaux, and E. C. Simon (*Louisiana Sta. Bul. 267 (1935), pp. 2–7*).—Experiments with sugarcane reviewed included extensive variety trials (E. S. R., 71, p. 628) and deterioration studies, date-of-planting tests, rotations, cultivation experiments, development of propagation methods and a simple, rapid method for determining the maturity of cane in the field, and the yield response to sodium nitrate of corn following stubble cane of the new hybrid varieties v. corn after corn and green manure of soybeans.

The nomenclature and genetics of sugar cane seedlings, A. H. Rosenfeld (*Internatl. Sugar Jour., 37 (1935), No. 441, pp. 341–346*).—The varietal information compiled outlines the botanical position and specific characters of *Saccharum*, explains the initialing and numbers of seedling varieties, and indicates the parentage of the principal sugarcane varieties used in breeding work.

Tobacco fertilizer recommendations for 1936, C. B. Williams et al. (*North Carolina Sta. Agron. Inform. Circ. 95 (1935), pp. [6]*).—Analyses, rates per acre, and sources of nutrients are recommended for fertilizers for flue-cured, sun-cured, and shipping tobacco, and for plant beds on tobacco soils in Virginia, North Carolina, South Carolina, and Georgia. Suggestions for control of downy mildew and root knot of tobacco are appended.

Correlating yield with phenological averages to increase efficiency in wheat breeding, B. G. Moussouros and D. C. Papadopoulos (*Jour. Amer. Soc. Agron., 27 (1935), No. 9, pp. 715–723, fig. 1*).—Correlation of yields secured at the Superior School of Agriculture in Athens, 1930–31 to 1933–34, for 99 wheat varieties with number of days from planting to heading, from planting to ripening, and from heading to ripening showed that in general good correlation existed between yield and the 3 variables, confirming the view of farmers that earliness is of prime importance in obtaining higher wheat yields in eastern Greece. The rather constant association found between yield and number of days to heading indicated that this phenological average might serve as an index of the varietal productiveness. Its significance was stressed further by high and consistent positive coefficients of correlation between yield and number of days from heading to ripening. It did not seem wise to obtain varieties heading earlier than Balilla, which heads April 1–10 in Athens, unless they also develop a drought-resistant complex, enabling them to prolong their ripening period and to resist early spring frosts.

The winter hardiness of winter wheat varieties [trans title], V. A. Pesola (*[Finland] Valtion Maatalouskoet. Julkaisu. (Staatl. Landw. Versuchstät. Veröffentl.), No. 65 (1934), pp. 36, figs. 7; Finn. abs., pp. 35, 36*).—Comparative studies, 1925–34, in southern Finland with 164 varieties and strains of native and introduced winter wheats revealed that Finnish improved and common wheats usually led in winter hardiness, Pohjola, Varma, and Sampo being examples of outstanding varieties, whereas the Swedish, German, and American wheats tested were inferior thereto and ranked low or unsuitable in winter hardiness.

Soil reaction and varietal adaptation, J. S. Papadakis (*Inst. Kallit. Fyton Thessalonike Epist. Delt. (Inst. Plant Breeding, Salonica, Greece, Sci. Bul.),* No. *18 (1935), pp. [16], figs. 3; Eng. abs., pp. 7–9*).—Wheat varieties were observed to vary considerably (20 to 40 percent) in relative yields when grown in pots on soils differing in reaction. Progenies of crosses between alkalo- and acidophilous wheats were acidophilous. Similar behavior was noted with oats varieties. The advantages of pot experiments over field plats in studies of relative drought resistance and adaptation to soil reaction are pointed out.

Varieties experiments in pots, J. S. Papadakis (*Inst. Kallit. Fyton Thessalonike Epist. Delt. (Inst. Plant Breeding, Salonika, Greece, Sci. Bul.), No. 20 (1935), pp. 16, figs. 5; Eng. abs., pp. 8–12*).—Pot experiments in the open air appeared to surpass field trials for preliminary tests of cereal varieties, strains, or hybrids. The high correlation between relative yields of wheat varieties in 1-yr. pot tests and mean yields of prolonged field tests at the same station greatly exceeded that between yields in 1 yr. of extensive field tests and mean yields over a long period of field tests. Other advantages of pot experiments are pointed out and technic is outlined.

The pocket method of varieties experiments, J. S. Papadakis (*Inst. Kallit. Fyton Thessalonike Epist. Delt. (Inst. Plant Breeding, Salonika, Greece, Sci.*

Bul.), No. 21 (1935), pp. [8], figs. 4; Eng. abs., pp. 5, 6).—Wheat yields obtained in several localities in Greece, by the pocket method, in which each strain of a small grain is planted in hills spaced 20×20 in. apart and 20-replicated, were highly correlated with yields in field plats. Advantages compared with plat tests include smaller areas, less seed, economy of labor, and more tests in different locations.

The relation of number of wheat heads and increased yield as influenced by phosphate and nitrogen fertilizers, F. G. PARSONS (*Amer. Fert., 83 (1935), No. 2, pp. 5, 6, fig. 1*).—Increased yields from application of phosphorus fertilizers to wheat, obtained in 1934, on soil fields of the Kansas Experiment Station seemed to be related to an increased number of spikes as influenced by tillering. Sodium nitrate, alone, produced a decrease in yield, probably because it so delayed maturity that drought prevented normal kernel development. However, phosphorus fertilizer applied with the sodium nitrate compensated for the effect of the nitrogen by the tendency of phosphorus to hasten maturity, thus producing a more than additive increase in yield.

[Response of different varieties of oats to nitrogen], G. SUNDELIN and I. BACHÉR (*K. Landtbr. Akad. Handl. och Tidskr., 73 (1934), No. 8, pp. 880–913, figs. 2; Eng. abs., pp. 910–912*).—In experiments throughout Sweden, 1926–31, several important oat varieties received 0, 20, and 40 kg of nitrogen per hectare as sodium nitrate with basal dressings of superphosphate 300 kg and 40 percent potassium salt 200 kg. Yield responses indicated that larger applications could be used more profitably in southern than in northern Sweden, where 100 kg of sodium nitrate seemed the economical limit. The lower increases of Roslag and Orion II, compared with Golden Rain I and II and Engelbrekt, were attributed primarily to earlier and more extensive lodging. Grain quality was not affected much, although weights per hectoliter and 1,000 kernels tended to decline, especially with the heavier nitrogen applications.

HORTICULTURE

[Horticultural studies by the Idaho Station] (*Idaho Sta. Bul. 217 (1935), pp. 7, 31, 32, 49*).—Brief progress reports are presented on studies in spray residue removal, apple breeding, orchard fertilization, cracking in cherries, concentration of cherry and prune juice by freezing, and the value of black locust for woodlot and shelter belt plantings.

[Horticultural studies by the Delaware Station] (*Delaware Sta. Bul. 192 (1935), pp. 37–39*).—Among studies reported are those dealing with the physiology of the dropping of immature fruits, and the effect of insects on fruit dropping, both by L. R. Detjen and L. H. Strubinger; and the normal variation in growth of apple trees on seedling and on own roots, and the chemical composition of the roots and shoots of own and seedling rooted Rome Beauty trees, both by F. S. Lagassé.

[Horticultural studies by the Minnesota Station, 1885–1935] (*Minnesota Sta. Bul. 319 (1935), pp. 49–52, 57, 71, 78*).—Results are reported of studies on the breeding and testing of hardy fruits, fruit culture, truck crops and potatoes, ornamental horticulture and floriculture, and fruit and vegetable ripening and blanching.

[Horticultural studies by the North Carolina Station] (*North Carolina Sta. Rpt. 1933, pp. 64–66, 67–70*).—Included are the results of experiments on carbohydrate and nitrogen changes in the peach tree as influenced by nitrogen fertilization and defoliation treatments, and on the relation of time and rate of nitrogen fertilization to growth and yield of the peach, both by C. F. Williams; the relation of leaf area and leaf efficiency to the development and quality of peach fruit and to growth of the tree, by I. D. Jones; differential fertilizer treatments for peach trees in the Piedmont, by M. E. Gardner; the economics of peach growing, by G. W. Forster and R. H. Rogers; raspberry variety tests, by Gardner and J. G. Weaver; food storage in the dewberry as influenced by pruning and fertilization, and breeding of raspberries and dewberries, both by Williams; response of strawberries to lime, by E. B. Morrow; and fertilizer and cultural studies of cabbage and onions, by Schmidt.

Sprays, their preparation and use, R. H. Robinson (*Oregon Sta. Bul. 336 (1935), pp. 30, fig. 1*).—This bulletin discusses approved methods of preparing various insecticides and fungicides that may be home-made and emphasizes precautions that should be taken to insure the best results. General information is presented on physical and chemical properties of different materials and the compatibility between materials that might be used in combination sprays.

Breeding greenhouse vegetable crops, I. C. Hoffman (*Ohio Veg. Growers Assoc. Proc., 19 (1934), pp. 45–48*).—In this brief report on breeding investigations with tomatoes, lettuce, and cucumbers at the Ohio Experiment Station, descriptions are presented of the Marhio tomato and a tipburn-resistant leaf lettuce designated as Strain No. 7.

Beet variety test, C. L. Isbell (*Alabama Sta. Rpt. 1934, p. 29*).—Several varieties are compared as to yield, color of the flesh, etc.

Sweet corn variety and strain test for 1933, C. H. Mahoney (*Ohio Veg. Growers Assoc. Proc., 19 (1934), pp. 91–97*).—In variety tests conducted at the Michigan Corn Borer Experiment Station it was found that practically all hybrid corns, particularly those resulting from crossing two inbred lines, outyielded corn ripening at the same time. Extremely early varieties, such as Golden Gem, Spanish Gold, and Golden Early Market were too small in ears and too low in yield to have market-gardening value. A significant negative correlation of —0.64±0.06 was found between the percentage of wilt at the final reading and the total marketable ears.

The influence of the length of the interval between pickings on the yield and grade of pickling cucumbers, H. L. Seaton (*Michigan Sta. Spec. Bul. 259 (1935), pp. 20, figs. 9*).—Based on averages of 3 years' records taken on plats of a pure line of the National Pickling cucumber, in which harvests were made on 1-, 2-, 3-, and 4-, and in one year 7-day intervals, it was established that frequent picking increases the total number of fruits produced but decreases the total yield in pounds; for example, the numbers of pickles for the 1-, 2-, 3-, and 4-day intervals were 3,764, 3,020, 2,657, and 2,179, respectively, while the yields in pounds were 4,570, 5,357, 6,720, and 8,139. With respect to quality of the pickles, less frequent gathering decreased the percentage of the small, desirable grades but had no material influence on the precentage of nubbins and crooks. Finding that where the interval between pickings was more than 4 days there was a large increase in the percentage of oversized culls, the author suggests that under ordinary conditions cucumber plantings should be picked twice a week. Furthermore, the financial returns per acre were largest for the 4-day intervals despite the higher prices received for the smaller pickles. High financial returns were apparently determined by large yields, which in turn depended upon proper soil, culture, and the control of pests.

Head lettuce experiments in the greenhouse and field, I. C. Hoffman (*Ohio Veg. Growers Assoc. Proc., 19 (1934), pp. 28–32*).—The results of strain tests carried on by the Ohio Experiment Station in greenhouses at Wooster and in the field at Columbus indicated that the New York type of lettuce varies considerably in time of maturity, uniformity, and average weight of heads.

Influence of storage temperature and humidity on keeping qualities of onions and onion sets, R. C. WRIGHT, J. I. LAURITZEN, and T. M. WHITEMAN (*U. S. Dept. Agr., Tech. Bul. 475 (1935), pp. 38, figs. 12*).—Observations on several varieties of onions, purchased for the most part on the open market and stored under controlled conditions at Arlington Experiment Farm, Va., showed that the amount of sprouting occurring during storage is influenced but little by humidity but rather definitely by temperature. On the other hand root formation was little influenced by temperature, but it was increased by increasing the humidity. The amount of decay showed only a slight general tendency to increase as both temperature and relative humidity were increased, and most of the decay was identified as neck rot. Onion sets showed an increase in sprouting, rooting, and decay as the storage temperatures increased and as relative humidities increased at each storage temperature. The best storage environment for both onions and sets was found to be 32° F. with a relative humidity of about 64 percent. Physiological break-down, comparable in symptoms to the results of freezing injury, was observed in both storage and field before any actual freezing occurred. In Yellow Globe onions stored at 32° there was noted a somewhat higher percentage of affected bulbs in lots in the higher humidity chambers. In the experiments break-down was manifested by a very limited amount of watery discoloration in the outer scales only.

Influence of heredity with respect to a fruit defect in the tomato, S. H. YARNELL (*Texas Sta. Circ. 76 (1934), pp. 19, 20*).—"It was found that varieties, certain strains of the older varieties, and a number of individuals within such strains differ genetically with respect to factors affecting the amount of puffing. Where a difference due to selection of individuals within a strain was found, the families from the lower puff selection averaged 20.7 percent puff, while the families from the high puff selection averaged 30.7 percent puff. Acme, John Baer, and certain strains of Bonny Best, Earliana, Gulf State Market, and Cooper Special have a relatively small amount of puff. Certain strains of Globe and Stone and all strains of Albino and Marglobe were found to have a relatively large amount of this defect."

Why do over-vegetative tomato plants fail to set fruit? F. S. HOWLETT (*Ohio Veg. Growers Assoc. Proc., 19 (1934), pp. 40–45*).—Observations by the Ohio Experiment Station showed that in overvegetative tomato plants the lower flower clusters often contained blossoms in which the tips of the anthers and the stigmas were on the same level and with the anthers enclosing the style so tightly that pollen could not sift down past the edge of the stigma. In such plants a considerable portion of the pollen was nonviable. Under certain conditions of low light in the late fall and winter plants may become so deficient in carbohydrates as to develop no fertile pollen. In the absence of abundant pollen, hand pollination was more successful than simply jarring the clusters.

The freezing of fruits and vegetables, T. N. MORRIS and J. BARKER (*[Gt. Brit.] Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1934, pp. 162, 163*).—Experiments with strawberries and raspberries frozen in vacuo and in tins charged with nitrogen gas showed that neither of these treatments is superior to tins containing air. Strawberries frozen at —20° and —10° C. kept satisfactorily, particularly when packed in sirup in tins. Blanching of peas for 1 min. in boiling water prior to freezing again was found beneficial, and marked differences were observed between varieties in their adaptability to freezing storage. The addition of small amounts of sodium carbonate to the blanching and covering water improved the appearance of Yeoman peas, one of the poorer freezing kinds. Citric acid, on the other hand, was deleterious. Rapid freezing (—20°) was again found helpful in the production of a satisfactory asparagus product.

Transit-refrigeration charges on fruit reduced by recent discoveries, D. F. Fisher and C. W. Mann (*U. S. Dept. Agr. Yearbook 1935, pp. 317–319, fig. 1*).—In discussing the importance of refrigeration in the transportation of the vast Pacific coast fruit crop to eastern markets, the authors report that recent studies have shown that instead of re-icing every 24 hr. during the journey one re-icing suffices if the fruit is cold at the start. Precooling of pears permitted the loading of more boxes per car, with consequent transportation savings.

Fruits and seeds of some common New Jersey trees, J. G. Fiske (*New Jersey Stas. Circ. 355 (1935), pp. 52, figs. 29*).—Accompanied by drawings of the fruits and seeds, descriptions are presented of the leaves, flowers, wood, fruits, and seeds of the more common trees of New Jersey, including coniferous and broadleaf species.

The State Experiment Orchard, Coromandel Valley, near Blackwood, South Australia, G. Quinn (*Jour. Dept. Agr. So. Aust., 38 (1935), Nos. 8, pp. 972–987, figs. 3; 9, pp. 1105–1124, figs. 12; 10, pp. 1245–1262, figs. 11; 11, pp. 1373–1391, figs. 8; 12, pp. 1509–1539, figs. 18*).—This report, covering the period 1908–34, includes a historical account of the development of the orchard, the experimental lay-out, and information on the results of various investigations, particularly those dealing with rootstocks for the pear, peach, and cherry.

Pruning bearing apple trees, J. K. Shaw (*Massachusetts Sta. Bul. 320 (1935), pp. 16, figs. 7*).—Utilizing four groups of trees, (1) Baldwin, Northern Spy, Rhode Island Greening, McIntosh, and King planted in 1916, (2) Wealthy planted in 1915, (3) Rhode Island Greening, Wealthy, McIntosh, and Ben Davis planted in 1897, and (4) Rhode Island Greening, Roxbury Russet, Baldwin, and Gravenstein planted in 1889, observations were made on growth and yield as influenced by different degrees of pruning. Measurements of trunk girth in the various blocks failed to show any important effects of pruning on growth, leading the author to assert "it seems very doubtful that pruning as carried out in these experiments with bearing trees has had much dwarfing effect." With respect to yield and quality of fruit in the case of the young trees in full vigor, pruning had less influence in improving size and quality than was anticipated, and the results suggest that favorable soil, good culture, fertilizer treatments, and fruit thinning when necessary are of primary importance. In certain cases, particularly the trees set in 1889, there was evidence that heavy pruning had reduced total yields. In the older trees the removal of weak and decadent wood not only did not reduce the crop but eliminated much of the low-grade fruit. In addition, pruning of the older trees facilitated the picking of the fruit. With the modern spray outfit the beneficial effects of pruning on scab and insect control were not pronounced.

Leaf area in relation to apple production, W. F. Pickett (*Kans. State Hort. Soc. Bien. Rpt., 42 (1932–33), pp. 107–111, fig. 1*).—The thinning of girdled branches of Delicious, Jonathan, Winesap, and York Imperial trees on June 8, 1933, to 1 fruit per 10, 20, 30, 40, and 50 leaves showed that varieties differ in their response to leaf adjustment. In Delicious, Jonathan, Winesap, and York Imperial the largest fruits were obtained, respectively, with 50, 30, 40, and 40 to 50 leaves. Delicious apples were as well colored with 30 as with 40 or 50 leaves. Winesap apples with 20 leaves were as well colored as with more, but Jonathan attained much better color with the higher leaf ratios.

Filler apple trees, C. W. Ellenwood (*Ohio Sta. Bul. 551 (1935), pp. 18, figs. 2*).—This study of individual tree records in two orchards established in 1922, totaling 10.8 acres and including apples as fillers between the permanent trees set 40 ft. apart, indicated on the whole that filler apples had been profitable up to the end of the twelfth growing season. Of the six varieties used as fillers, namely, Arkansas, Winesap, Stayman Winesap, Wealthy, McIntosh, and Grimes Golden, all except Wealthy required restrictive pruning at the end of the twelfth season. However, the tendency of Wealthy toward biennial fruiting reduced its value as a filler tree. McIntosh proved desirable because of its early fruiting and higher selling value. The author believes that McIntosh and Stayman Winesap could be maintained until the end of the fifteenth year and Grimes Golden and Wealthy perhaps a year or two longer.

Filler apple trees, C. W. Ellenwood (*Ohio State Hort. Soc. Proc., 68 (1935), pp. 112–120*).—A popular discussion based on the above study.

Removal of spray residues from apples, D. E. H. Frear and H. N. Worthley (*Pennsylvania Sta. Bul. 318 (1935), pp. 18, figs. 3*).—Stating that spray residues exceeded the legal tolerance in many instances in 1934 in Pennsylvania, the authors report the results of analyses of about 500 samples of apples subjected to different cleansing treatments.

Dry brushing was not found satisfactory, and in fact certain lots had more residue after brushing than before. Hand dipping gave fair results but is conceded to be practicable only in the case of small quantities. Flotation washers gave good results even with cold acid washes when the residues were not too great or complicated by heavy applications of oil. Washers provided with brushes were the most effective of all types tested.

Tests of alkaline and acid wash solutions indicated that under Pennsylvania conditions dilute solutions of hydrochloric acid are most effective. Concentrations above 2 percent by weight of hydrochloric acid tended to injure the fruit; 1.5 percent was considered most satisfactory. Heating the washing solution to 100° F. increased greatly its cleansing capacity and is recommended for fruits difficult to cleanse. The addition of common salt interfered with the removal of lead residues. Varieties differed markedly in their ease of washing, the Stayman Winesap and Smokehouse cleansing most readily, with Hubbardston the most difficult variety. When the fruit was properly rinsed, washing with dilute hydrochloric acid apparently did not impair keeping qualities.

The technic of preparing washing solutions is discussed, and a brief description by A. W. Clyde is included of a small home-made flotation washer.

Study of the removal of spray residues from apples, D. E. H. Frear and H. N. Worthley (*Jour. Agr. Res.* [U. S.], *51 (1935), No. 1, pp. 61–74*).—This is a technical presentation of the information noted above.

Harvesting and storage of McIntosh and Fameuse apples, M. B. Davis and D. S. Blair (*Canad. Hort. and Home Mag., 58 (1935), No. 9, pp. 205, 206, figs. 2*).—Studies at the Central Experimental Farm, Ottawa, indicated that McIntosh and Fameuse apples keep best when harvested at the time the flesh gives refractometer readings of 13 and 12 to 12.5 percent, respectively. The iodine-starch test was also useful in establishing proper picking dates, and certain physical factors, such as seed color, fruit color and size, and ease of separation from the spur are described as useful indexes to maturity. The holding of Fameuse apples more than 48 hr. after picking and before storage resulted in a marked increase in internal break-down. In the case of immature apples, storage at 30° and 32° F. increased the amount of scald as compared with 36° or 40°, but fruit picked at the proper stage did not show these differences. Although 40° was a safe temperature for McIntosh, it was apparently too high to prevent ripening in storage. McIntosh apples held in a 7.5 percent carbon dioxide atmosphere at 38° or 40° kept better than fruits in normal air.

The metabolism of nitrogen by apple fruits during development on the tree and in storage, A. C. Hulme (*[Gt. Brit.] Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1934, pp. 135–143, figs. 7*).—Seeking to establish whether changes in nitrogenous fractions of the apple could be related to break-down, observations were made on Worcester Pearmain and Bramley Seedling fruits, nonsusceptible and susceptible varieties, respectively, stored at 1° and 4° C. in air and in various mixtures of carbon dioxide, oxygen, and nitrogen. The data are said to suggest that there may be some connection between low temperature break-down and abnormalities within the soluble nitrogen fraction. About 50 to 55 days before break-down the amino acid nitrogen rose to a maximal percentage of the soluble nitrogen in 1° Bramley Seedling apples, whereas in Worcester Pearmain apples there was only a barely significant rise at 173 days. The decline in soluble nitrogen continued through the life of the Bramley Seedling apple. Apples from ringed trees appeared to contain more of their soluble nitrogen in amino acid form than did those from unringed trees. Observations on apples gathered at different stages of development showed a striking decrease in the total soluble nitrogen as a percentage of total nitrogen in both peel and pulp in the early stages. There was no great change in total protein and total soluble nitrogen fractions during the climacteric rise in respiration. An increase in protein during storage at the expense of soluble nitrogen was again apparent.

The effect of ammonia and of hydrochloric acid on the respiratory activity and the climacteric in apples, F. Kidd and C. West (*[Gt. Brit.] Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1934, pp. 130–132, fig. 1*).—The evolution of carbon dioxide from single Sturmer Pippin apples over which were passed currents of air containing known concentrations of hydrochloric acid or ammonia was compared with that of similar fruits in a current of pure air. At the temperature used, 20° C. (68° F.), hydrochloric acid had no appreciable influence on the pitch of respiratory activity, nor did it stimulate the onset of the climacteric. Ammonia, on the other hand, stimulated respiration at once, and in a day or two the climacteric appeared.

Identification of ethylene among the volatile products of ripe apples, R. Gane (*[Gt. Brit.] Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1934, pp. 122, 123, pl. 1*).—Placing of apples in a bell jar containing a plant of *Mimosa pudica* caused the leaves to fold and finally to yellow and in part to fall. When the apples were removed, the remaining leaves recovered their normal appearance and sensitivity. Similar results were secured with castor oil bean, tomato, and sunflower, but the sensitive plant *Biophytum sensitivum* was unaffected. Ethylene was identified among the gaseous products given off by ripe apples by absorption in bromine to yield ethylene dibromide. Since pea seedlings grown in a nitrogen-oxygen atmosphere, constituted of nitrogen issuing from a 15° C. chamber containing apples, grew normally, while bananas showed accelerated ripening under the same conditions, the author is not certain whether the production of ethylene ceases or is merely greatly reduced in the absence of oxygen. Ethylene was not produced by apples killed by freezing.

The effect of ethylene on apples at low temperatures: Evidence for the production of ethylene by unripe, immature fruit, F. Kidd and C. West (*[Gt. Brit.] Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1934, pp. 119–122, figs. 2*).—No effect was produced on the production of carbon dioxide when Bramley Seedling apples already showing a steady slow rise in respiratory activity in storage at 1° C. (33.8° F.) were treated with ethylene. The same result was secured when Sturmer Pippin apples gathered in the preclimacteric state and stored immediately in individual ventilated glass containers at 8° were treated with ethylene. It was evident that ethylene is without effect during the slow progress of the climacteric rise in fruits held at low temperatures. Immature Bramley Seedling apples averaging only 29 g in weight and stored at 10° in airtight but ventilated receptacles showed a rise in respiratory activity from ethylene applied prior to but not subsequent to their normal climacteric, indicating that ethylene is produced by immature apples and that there must be a threshhold value for the stimulating dose below which no effect is produced.

Gas-storage of apples, F. Kidd and C. West (*[Gt. Brit.] Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1934, pp. 103–109, fig. 1*).—Studies conducted with five varieties of apples, namely, Worcester Pearmain, King Edward VII, Cox Orange Pippin, Bramley Seedling, and Laxton Superb, showed that increasing the carbon dioxide and lowering the oxygen, as compared with ordinary air, had a beneficial effect on the keeping at certain temperatures. However, the varieties differed somewhat in their responses, and the most successful temperatures and atmospheres are indicated not only for the five varieties but also for nine others.

The internal atmosphere of apples in gas-storage, F. Kidd and C. West (*[Gt. Brit.] Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1934, pp. 110, 111*).—In a population of Bramley Seedling apples stored in air at 15° C. (59° F.) it was found that the difference in concentration of oxygen and carbon dioxide between the internal and external atmospheres gave, when plotted against the time, a curve similar to that for respiratory activity. The actual differences varied between 2 and 5 percent. In Sturmer Pippin apples the differences were as great as 8 to 9 percent.

The cause and control of low-temperature breakdown in apples, F. Kidd and C. West (*[Gt. Brit.] Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1934, pp. 117–119, figs. 2*).—Apples of high nitrogen type, presumably susceptible to break-down, gathered at three different stages of maturity, namely, preclimacteric, climacteric, and postclimacteric and stored at 34° F., attained 25 percent break-down in 172, 103, and 120 days, respectively. Since respiratory activity was slightly higher in the early gathered fruits, the author suggests that there is some other factor involved in break-down than simply the pitch of respiratory activity.

Injury in Australian apples due to carbon dioxide at low temperatures, J. Barker and F. Kidd (*[Gt. Brit.] Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1934, pp. 109, 110*).—Observations on Sturmer Pippin and King David apples held at temperatures of 25°, 28°, 32°, and 41° F. in two atmospheres containing (1) 2 percent carbon dioxide and 19 percent oxygen, and (2) 5 percent carbon dioxide and 16 percent oxygen showed that both varieties are susceptible to low temperature break-down at 32°, that the presence of 5 percent carbon dioxide may cause brown heart at temperatures below the optimum, and that 5 percent carbon dioxide may be markedly beneficial at a temperature of 41°.

Pear production increased by maintaining adequate soil moisture, R. A. Work (*U. S. Dept. Agr. Yearbook 1935, pp. 273–275*).—In irrigation experiments conducted near Medford, Oreg., it was found that the increased yields obtained by maintaining soil moisture in a highly available condition resulted in a decreased production cost per box. In order to attain maximum fruit size the moisture content of the major portion of the root zone should be held at not less than 80 percent of the maximum available capacity, and a reduction below 50 percent in any material portion of the zone resulted in diminished fruit growth. In the presence of abundant soil moisture fewer leaves per fruit were needed to produce large-sized Bartlett pears. A positive correlation was noted between the observed density of small, visible roots and the rate of soil moisture extraction. A total of approximately 84 percent of the feeder roots of Anjou and Bartlett pear trees was located in the upper 3-ft. zone.

Sterility of pears (*Vermont Sta. Bul. 396 (1935), pp. 27, 28*).—Histological studies of the nature of sterility in the pear are briefly noted.

The effect of the box on the ripening of pears, J. Barker and C. R. Furlong (*[Gt. Brit.] Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1934, p. 160*).—Beurre Bosc pears from the Union of South Africa and Victoria showed more core break-down when ripened in the box than on open trays. Observing more break-down in inner layers, it was found that the temperature was actually 1° F. higher in the interior of the box.

Conditioning of cold-stored fruit prior to retail, J. Barker and C. R. Furlong (*[Gt. Brit.] Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1934, pp. 159, 160*).—Williams Bon Chretien (Bartlett) pears ripened at 45° F. reached only fair quality, with severe losses from scald. With an initial conditioning for 3 days at 70° fruit ripened in excellent condition. With Beurre Hardy, Kieffer, and Winter Nelis conditioning at 70° made no difference. Kelsey plums did not attain good quality at 47°.

Varieties of peaches for the Yazoo-Mississippi Delta, E. A. Currey (*Mississippi Sta. Bul. 308 (1935), pp. 15, figs. 13*).—Brief descriptive and performance notes are presented on a large number of peach varieties, and brief information is given on planting, pruning, fruit thinning, insect and disease control, etc. Based on averages, Hiley was the most productive variety and Lucy Bunn produced the largest fruits.

Evaporation from plums, A. J. M. Smith (*[Gt. Brit.] Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1934, pp. 152, 153, fig. 1*).—In experiments carried on at different temperatures unripe plums lost weight more rapidly at any given relative humidity than did ripe fruits, the curve for the ripe plums approaching a straight line.

Berry breeding has made available some valuable new varieties, G. M. Darrow and G. F. Waldo (*U. S. Dept. Agr. Yearbook 1935, pp. 136–138, figs. 2*).—A total of 7 new strawberries, 2 raspberries, 1 blackberry, and 1 gooseberry developed and introduced by the Department in the course of its berry-breeding research activities is discussed.

Picking, handling, and refrigeration of raspberries and strawberries, J. D. Winter, W. H. Alderman, and W. C. Waite (*Minnesota Sta. Bul. 318 (1935), pp. 39, figs. 15*).—Utilizing ice-cooled and mechanically operated refrigerators, it was found that the marketable condition of berries could be prolonged for several days in such equipment. The principal factors concerned in maintaining marketable condition were (1) firmness of the variety, (2) freedom from injuries, (3) stage of maturity at picking, (4) weather conditions during the ripening period, and (5) temperature at which the berries were stored.

No appreciable difference was found in the keeping quality of Latham and Chief raspberries, except that the latter retained its bright appearance longer. Without refrigeration, raspberries picked in the cooler portion of the day kept longer than those gathered at midday when the temperature of the fruit was higher than that of the surrounding air. Raspberries placed in an enclosed building with windows and doors open cooled more slowly than those in a shed open on three sides. The type of container was an important factor, well ventilated packages facilitating cooling. In refrigeration tests a few hours' delay in placing berries in the cooler had no appreciable influence on their length of keeping, but berries held a whole day before cooling did show a decided loss in keeping quality. After the first 24 hr. the length of storage had an important bearing on the life of fruit after removal from storage. Under the existing conditions the maximum duration of the poststorage period was 59 hr. after 24 hours' storage and the minimum only 8 hr. after 7 days. With small quantities of fruit the rate of cooling in an ice refrigerator equipped with a fan was much more rapid than without a fan. The construction and operation of an ice-cooled refrigerator adapted to home use is discussed.

The absorption by grapes of iodine from iodized wraps, R. G. Tomkins (*[Gt. Brit.] Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1934, pp. 156–158*).—Preliminary observations showed that iodine is absorbed much more rapidly by stalks than by berries and that exposure to the air for periods up to 10 days did not result in an appreciable loss of the absorbed iodine.

The effects of ozone on bananas, R. Gane (*[Gt. Brit.] Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1934, pp. 128–130, fig. 1*).—Measurements of the rate of production of carbon dioxide by green bananas at 15° C. were made in atmospheres containing different concentrations of ozone. With 40 p. p. m. the rate of carbon dioxide evolution was higher than in fruits ventilated with fresh air, whereas in air containing from 25 to 30 p. p. m. the rate was only slightly higher than in air. With from 5 to 7 and 1.5 p. p. m. of ozone there was no significant change in the rate of respiration or of ripening.

The acidity and sugar-content of bananas during ripening, R. Gane (*[Gt. Brit.] Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1934, pp. 132, 133, fig. 1*).—Observations with a glass electrode on bananas taken from the same cluster and stored at 15° C. showed very rapid changes in acidity of the pulp during ripening, from pH 5.26 to 5.5 in green to a maximum of pH 4.34. At 0° there was a slight rise in pH in 16 days, with no change in the rate of evolution of carbon dioxide and with a blackening of the fruits. Tabulated data on changes in sugars accompanying ripening showed a great increment in sucrose and total sugars in the final stages of maturity.

Combustible gaseous products of fruits, R. Gane (*[Gt. Brit.] Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1934, pp. 124–128, figs. 2*).—Measurements of the total amount of combustible gaseous substance produced by ventilated ripe oranges held at 15° C. (59° F.) showed a constant output as long as the fruits were sound, after which the output of combustible gases and of carbon dioxide greatly increased. In another test, doubling the rate of ventilation after 8 days approximately doubled the output of combustible matter, and the removal of the outer layers of the peel greatly increased the production of combustible material and of carbon dioxide. In experiments with bananas ripening at 15° there was noted a large and rapid increase in the output of combustible substances in the later stages of maturity. The injury of green bananas did not stimulate their rate of ripening. The ozone and iodine pentoxide methods of estimating unsaturated gaseous products are discussed.

Hybridization of coffee, C. A. Krug (*Jour. Heredity, 26 (1935), No. 8, pp. 325–330, figs. 6*).—In connection with a description of the coffee flower and its habits of bloom, the author discusses methods of technic employed by the Agronomical Institute of São Paulo, Brazil, in the emasculation and hybridization of coffee.

Orchard heaters, L. L. English (*Alabama Sta. Rpt. 1934, p. 26*).—A brief report is given of trials of heaters and fuels in the Mobile County satsuma orange area.

The construction and operation of the mound orchard heater, L. L. English (*Alabama Sta. Spec. Circ., Nov. 1934, pp. 11, figs. 7*).—This heater, constructed of soil and using coke as a fuel, was found satisfactory in the satsuma orchards of southern Alabama.

Effect of different temperatures, humidities, and free ammonia on pecans in storage, O. C. Medlock (*Natl. Pecan Assoc. Proc., 32 (1933), pp. 21–28; abs. in Alabama Sta. Rpt. 1934, p. 7*).—Four years' storage studies with

Frotscher and Stuart pecans indicated that temperature is the outstanding factor concerned in successful storage. Nuts of both varieties kept in good marketable condition for 1 yr. or longer at 32° F. in either low or uncontrolled relative humidity. Under high temperatures kernels of the Frotscher molded more than did those of Stuart, but the latter became rancid somewhat earlier. At all three temperatures, namely, 32°, 40°, and 50°, uncured nuts kept as well as cured nuts; in fact mold did not develop as readily on the kernels of uncured as on cured nuts. Although 40° was more effective than 50°, it was not low enough to hold nuts in good condition for a year. The presence of free ammonia in the storage chamber caused darkening of the surface of the kernels.

Polishing, bleaching, and dyeing the pecan, L. M. Ware (*Natl. Pecan Assoc. Proc., 32 (1933), pp. 42–44; abs. in Alabama Sta. Rpt. 1934, pp. 9, 10*).—Observations at the Alabama Experiment Station showed that the surface of the pecan shell generally has exposed three distinct types of cells, each of which responds differently to bleaching agents. It was found necessary to remove all layers down to the schlerenchymous cells constituting the shell proper. Such removal was accomplished by steel brushes or by placing the nuts in revolving drums with coarse sand. After polishing pecans were bleached satisfactorily by dipping them for 4 min. in a solution of sodium hypochlorite containing 2 percent active chlorine and then for 1 min. in a 0.25 percent sulfuric acid bath. Polished and bleached nuts were attractively colored by various dyes, including chrysoidine 1/200 to 1/300 of 1 percent, basic brown 1/50 to 1/150 of 1 percent, or phosphine 1/4 to 1/16 of 1 per cent. No dye offered much promise on unpolished nuts.

The tung-oil tree, W. Newell, H. Mowry, and R. M. Barnette, rev. by A. F. Camp and R. D. Dickey (*Florida Sta. Bul. 280 (1935), pp. 67, figs. 30*).—A revision of an earlier bulletin (E. S. R., 64, p. 639), this presents additional information on recent developments, such as the control of bronzing by the application of zinc sulfate to the surrounding soil.

[Floricultural studies by the North Carolina Station] (*North Carolina Sta. Rpt. 1933, pp. 75–79*).—Brief reports are presented of the results of varietal tests with herbaceous perennials, tulips, garden and greenhouse roses, dahlias, and carnations, and propagation studies with the poinsettia, all by G. O. Randall and J. G. Weaver.

The greenhouse culture of carnations in sand, H. M. Biekart and C. H. Connors (*New Jersey Stas. Bul. 588 (1935), pp. 24, figs. 9*).—Using a modified triangle system with 26 nutrient solutions applied by the constant drip method, it was found that when an excess of potassium phosphate was present Enchantress carnations failed to open properly, and that when an excess of magnesium sulfate was present the blooms were grayish white, water-soaked in texture, and would not open. Three of the 26 solutions produced very satisfactory plants and flowers. Using the most promising solution, several varieties were grown in the greenhouse in sand and in soil with the usual practices. Although flower production was somewhat greater in the soil, there was practically no difference between treatments with respect to quality and size of flowers and length of stems. The Enchantress carnation produced fewer split flowers in sand than in soil.

Repetition of the experiment, using some of the sand again, showed that sand produces flowers of equal quality to those in soil and that sand may be used the second year satisfactorily. No essential difference was noted between plants growing in washed white sand and in yellow sand containing some silt and clay. A continuation of the experiment showed that the same sand could be used at least for 6 yr.

Sand cultures gave better control of growth because this material could be flushed more effectively and the nutrients applied were more readily available. Field-grown plants proved more satisfactory than those continuously in the greenhouse, but it is believed that changes in procedure would overcome this difference. Rust and spider mites were less noticeable on sand-grown plants. Branch rot varied with varieties but was more abundant in the soil lots. Carnations did not require the addition of iron to the nutrient solution in order to prevent iron chlorosis.

A test of hardy chrysanthemums, A. Laurie (*Ohio Sta. Bimo. Bul. 175 (1935), pp. 139–141*).—Data are presented in tabular form on the height of plants, time of bloom, color, profusion of bloom, winter hardiness, and general characteristics of about 66 varieties.

FORESTRY

A Swedish-English vocabulary for foresters, J. L. Deen, A. B. Benson, and M. J. Dannfelt (*Yale Univ. School Forestry Bul. 40 (1935), pp. 83*).—This is a dictionary of the more common technical forest terms.

[Contributions from the Forest Service] (*U. S. Dept. Agr. Yearbook 1935, pp. 145–147, 151–153, 181–184, 191–194, 202–208, 210–217, 238–241, 282–284, figs. 18*).—Included are the following papers: Brush Fields Treated Before Planting so as to Insure Survival of Tree Growth, by C. W. Corson (pp. 145–147); Community Values May be Stabilized by Sustained-Yield Forestry, by F. H. Brundage (pp. 151–153); Erosion in the Black Hills After the Burning of the Forest Cover, by M. W. Thompson (pp. 181–184); Farming, Forestry, and Industry Profit from Land-Use Planning in California, by C. L. Hill (pp. 191–194); Forest Cover Proved a Controlling Factor in Flood Prevention, by C. J. Kraebel (pp. 202–206); Forest Removal Affects Local Climate and Growing Conditions, by O. M. Wood (pp. 206–208); Forestry Extension Work Aids Farmers to Earn Profits from Woodlands, by W. K. Williams (pp. 210–212); Forests Vital to Social and Economic Welfare of Many Communities, by F. A. Silcox (pp. 212–217); Land to Spare—A Conservation Problem in the Lake States, by R. N. Cunningham (pp. 238–241); and Ponderosa Way—A Firebreak Between the Lowlands and the Higher Timbered Belt, by R. W. Ayers (pp. 282–284).

[Forestry studies by the Alabama Station], L. M. Ware (*Alabama Sta. Rpt. 1934, pp. 28, 29*).—Data are presented on the growth of black locust trees as influenced by culture and fertilization and upon the adaptability of slash pine to different Alabama soils.

[Forestry work of the Minnesota Station, 1885–1935] (*Minnesota Sta. Bul. 319 (1935), pp. 43–46*).—The following subjects are briefly dealt with: The initiation of forest research and education in Minnesota, the management of the Cloquet Forest Experiment Station, other forestry practices and studies, taxation and land economic surveys, and a study of the value and possibilities of woodlot crops.

The Duke Forest: A demonstration and research laboratory, C. F. Korstian and W. Maughan (*Duke Univ. Forestry Bul. 1 (1935), pp. 74, pls. 29*).—This bulletin, with accompanying maps, describes the Duke Forest, sets forth its aims and policies regarding operation, and indicates something of the progress that has already been accomplished.

Forest improvement measures for the southern Appalachians (*U. S. Dept. Agr., Tech. Bul. 476 (1935), pp. 46, figs. 9*).—In this bulletin, prepared by the Appalachian Forest Experiment Station, first steps toward management of the complex forest stands of the southern Appalachians are recommended for the major forest types of the region, which are dominated, respectively, by spruce, northern hardwoods, oaks and chestnuts, cove hardwoods, yellow pines and hardwoods, and white pines and hardwoods. With the threefold purpose of bringing run-down or inadequately productive forests into condition to produce timber, protecting watersheds and soil, and encouraging game, directions are given as to what kind of silvicultural treatment should be given stands of different age classes and in different conditions as to growth and past history. The appendix includes lists of the principal native tree species, shrubs and vines, and forest insects common to the region.

Pruning and thinning a white pine plantation in the southern Appalachians, E. M. Simmons (*Jour. Forestry, 33 (1935), No. 5, pp. 519–522*).—Records taken in plantations established in 1917 by the U. S. D. A. Forest Service in the Nantahala (N. C.) National Forest showed that a total of 224 man days were required to thin and prune an area of approximately 9 acres, the trees on which had an average height of 35 ft. and were spaced 6 by 6 ft. An average of 415 trees per acre was left after operations.

Thinning loblolly pine in even-aged stands, H. Bull (*Jour. Forestry, 33 (1935), No. 5, pp. 513–518*).—Based on an analysis of experimental data from plats established by the Southern Forest Experiment Station near Urania, La., the conclusions are reached that (1) good sites offer greater possibilities for beneficial results from thinning than do poor sites, (2) thinnings that remove only the poorest and smallest trees seem of little practical benefit except as they remove salable material otherwise lost, (3) moderate to heavy thinnings of crop trees are generally beneficial and practical when the selected trees are badly crowded and there is a market for the thinnings, (4) thinnings early in the life of the stand generally are most beneficial, and (5) in readily accessible stands light thinnings may return a profit.

Slash disposal in ponderosa pine forests of the Southwest, G. A. Pearson and A. C. McIntyre (*U. S. Dept. Agr. Circ. 357 (1935), pp. 29, pls. 4, figs. 2*).—Among subjects considered in this general discussion, based largely on observations in the Coconino National Forest, Ariz., are the purposes of slash disposal, volume and distribution of slash, fire hazards, silvicultural influences of slash, economic and aesthetic aspects, and methods of slash disposal. The conclusion is reached that the methods of slash disposal to be employed in the pine forests of the Southwest should be varied to meet local conditions of fire hazard, tree reproduction, and herbaceous vegetation. On areas of high hazard or where valuable advance reproduction exists piling and burning are especially important, whereas in areas of slight fire hazard and where the soil needs cover the simple scattering of the slash without burning may be most desirable.

Tree rings in New England, C. J. Lyon (*Science, 81 (1935), No. 2101, pp. 340, 341*).—A study of the tree rings in six large hemlock stumps near Wolfeboro, N. H., showed a marked correlation between the widths of the annual rings and the rainfall during the growing periods. The trees made a rapid increase in rate of growth shortly after the year 1794, indicating a release cutting about that time.

The root system of a chestnut oak (Quercus montana Willd.), O. M. Wood (*Natl. Shade Tree Conf. Proc., 10 (1934), pp. 95–98*).—Studies of a 36-year-old tree located in the sandy coastal plan of New Jersey showed that most of the lateral roots ended in the humus layer just below the leaf litter. The ends of the lateral roots terminating under an old footpath were dead, suggesting that even a small amount of trampling may be fatal to the small feeding roots.

A total of 55 percent of the total dry weight of the tree was aboveground, and the area of the root spread was about 10 times that of the crown. Observation on about one-fifth of the total number of leaves showed the average leaf to have an area of approximately 7 sq. in. The entire leaf area of the tree was 44 sq. ft., or double the actual crown spread.

[Light requirements of white and Norway pines] (*Vermont Sta. Bul. 396 (1935), p. 25*).—Preliminary findings are briefly noted.

The growth of spruce and fir on the Whitney Park in the Adirondacks, G. S. MEAGHER and A. B. RECKNAGEL (*Jour. Forestry, 33 (1935), No. 5, pp. 499–502*).—Measurements taken in 1934 on an area from which the spruce and pine were selectively cut in 1898, with no further logging until present operations, showed the average dominant 10-in. diameter at breast height spruce trees in the softwood flat type to have grown 4 in. in diameter at breast height during the intervening 36-yr. period. A continuance of conservative cutting and present rate of growth are said to assure continuous operations on the basis of periodic sustained yields.

Germinating Kentucky coffee tree, E. G. WIESEHUEGEL (*Jour. Forestry, 33 (1935), No. 5, pp. 533, 534*).—All of five treatments, namely, filing and soaking for 5, 10, 30, and 120 min. in concentrated sulfuric acid of seeds which had been previously soaked for 24 hr. in water were found by the Ohio State University to be beneficial in promoting germination. Thirty days after sowing the germination percentages were 4, 80, 30, 44, 40, and 86, respectively, for the control, scarified, and 5-, 10-, 30-, and 120-min. acid treatments, respectively. Scarification, although almost as successful as acid treatment, was too laborious and costly.

Losses of black locust planting stock in storage, H. G. MEGINNIS (*Jour. Forestry, 33 (1935), No. 5, pp. 534, 535*).—Observations by the Southern Forest Experiment Station in connection with erosion control plantings near Holly Springs, Miss., indicated that black locust seedlings should be heeled in in sand rather than in the heavier silt and clay loam soils.

A simplified increment determination on the basis of stand tables, H. A. MEYER (*Jour. Forestry, 33 (1935), No. 9, pp. 799–806, figs. 2*).—A method known as "méthode du contrôle" used in several European countries for determining periodic growth of the forest is presented, with discussion as to its possible application to research and silvicultural practice in the United States.

Increment tables for the oak type, A. C. MCINTYRE (*Jour. Forestry, 33 (1935), No. 5, pp. 535, 536*).—Annual and periodic growth tables based on computations from data previously published (E. S. R., 69, p. 808) are presented by the Pennsylvania Experiment Station for oak-type forests.

The gnawing of metal tree tags by rodents, J. G. KUENZEL (*Jour. Forestry, 33 (1935), No. 5, pp. 532, 533, fig. 1*).—Records are presented of the destruction of metal tree labels by northern red and also gray squirrels.

DISEASES OF PLANTS

List of common names of British plant diseases (*Cambridge, Eng.: Univ. Press [1934, 2 ed.], pp. 95*).—This list was compiled by the plant pathology committee of the British Mycological Society, and is a revision of a compilation by the plant pathology subcommittee in 1928. It contains the names of 7 additional hosts and about 50 additional diseases. But few changes have been made in the common names, but considerable revision of the scientific names of pathogens was found necessary to conform to the international rules of botanical nomenclature (E. S. R., 72, p. 460).

The order followed is by crop groups (e. g., cereals, pasture and forage crops, vegetables, etc.), under which the individual hosts are listed by common and generic names, with their diseases. For each disease the accepted English common name is first given, followed by the scientific name and other common names in English and other languages. Occasional local notes are included. A list of authors' names and abbreviations and an index of hosts by common names are provided.

Physiologic specialization of the parasitic fungi, G. M. Reed (*Bot. Rev., 1 (1935), No. 4, pp. 119–137*).—This is a review, accompanied by a bibliography of 95 titles, compactly summarizing the development of scientific knowledge on this subject down to the present time. The following topics are discussed: Physiologic specialization in the cereal rusts, geographical distribution of rust races, physiologic specialization in the smuts, physiologic specialization in the powdery mildews and other fungi, morphological variations in specialized races, influence of environal factors on the reaction of differential hosts to various physiologic forms of rusts, the constancy of specialized races, and origin of new specialized races.

The Polyporaceae of Pennsylvania.—II, The genera Cyclomyces, Daedalea, Favolus, Fomes, Lenzites, and Trametes, L. O. Overholts (*Pennsylvania Sta. Bul. 316 (1935), pp. 16, figs. 12*).—Continuing studies of this group of fungi previously reported (E. S. R., 70, p. 487), the author gives keys and résumés of the following genera from Pennsylvania: *Cyclomyces* (1 species), *Daedalea* (4 species), *Favolus* (1 species), *Lenzites* (3 species), *Fomes* (23 species and 2 varieties, including *F. subroseus* n. comb.), and *Trametes* (10 species, including *T. americana* n. sp. and *T. carbonaria* n. comb.).

The initiation of the dikaryophase in Puccinia phragmitis (Schum.) Körn, I. M. Lamb (*Ann. Bot. [London], 49 (1935), No. 195, pp. 403–438, pls. 2*).—Following a full account of previous work on the sexuality of the Uredineae, the author details the methods and results of his study of *P. phragmitis*, a heterorust with spermogonia and aecia on species of *Rumex* and *Rheum* and with uredo and telio stages on *Phragmites communis*, shown by cultural tests on *Rumex crispus* to be heterothallic.

With insects excluded, the monosporidial pustules remained sterile, but when fertilized by transferring spermogonial nectar they always developed normal, open aecia. The duration of the process was less for the older than for the younger pustules.

All of the polysporidial and over half of the bisporidial infections protected from insects developed open aecia. In the polysporidial infections the dikaryophase was initiated by direct union within the aecial primordia of hyphae from different sporidia, this union taking the form of the cell fusions described by A. H. Christman and others. When monosporidial infections were kept isolated the central spermogonia died after functioning for some time, and were replaced by new spermogonia developed centrifugally. The haploid aecial wefts contained some multinucleate cells and also showed occasional vegetative cell fusions. With increasing age the aecial wefts and vegetative mycelium became highly vacuolated, except at the periphery of the pustule. In monosporidial infections fertilized by spermatial nectar the spermatia became attached laterally to the spermagonial periphyses by short hyphae, and structures resembling small nuclei occurred once, both in the spermatium and in the periphyses with which it was fused.

Numbers of very small nuclei of spermatial origin were seen 24 hr. after fertilization in the vegetative mycelium along the hyphae of which they migrated. Partial dissolution of the septa occurred. At a later stage these spermatial nuclei entered the basal cells of the aecial wefts where dikaryons consisting of spermatial and thallus nuclei were formed. At this stage fusion cells were occasionally seen, but there is strong evidence that they had originated from previous vegetative hyphal fusions. Although multinucleate spore chain mother cells occurred frequently, the spores arising from them were mostly binucleate.

In the fertilization of old, vacuolated, monosporidial infections the protoplasm of the thallus cells through which the spermatial nuclei had passed was regenerated, and no new conductive hyphae were formed. After diploidization of the basal cells was completed a number of spermatial nuclei were left in the ground mycelium, but they did not conjugate with the thallus nuclei. Their presence was probably due to the large number of spermatia transferred in experimental fertilization.

Syngamic reactions were manifested only between monospore mycelia which had reached a certain age, and no fusions occurred between germinating sporidia or between sporidia and spermatia.

An attempt to induce infection in the aecial host by spermatia was unsuccessful.

Heterothallism, in general, and the nature of the spermogonia are briefly discussed, and a literature list of 170 titles is appended.

Key to the rusts of the Pacific Northwest, J. W. HOTSON (*Wash. Univ. [Seattle] Pubs., Biol., 3 (1934), pp. 193, figs. 39*).—This contribution from the University of Washington constitutes a manual of the rusts (Uredinales), including, in addition to descriptive matter, keys to the families, to the genera under each family, and to the rusts in relation to their hosts. The general plan has been to list all the rusts reported for the States of Washington, Oregon, Idaho, and Montana under the families and genera of the hosts on which they occur, the host families and genera within the families being alphabetically arranged. The types of sori and spores for each of the five families of rusts are illustrated. Indexes of the scientific names of the hosts and of the rust species are provided.

Virus diseases of East African plants.—I, Introduction, H. H. STOREY (*East African Agr. Jour., 1 (1935), No. 1, pp. 63–68*).—This introductory portion of the series comprises a general discussion of the viruses and their properties, their diversity, their dependence on living tissue, their transmission by insects, and the principles underlying the methods by which they may be controlled.

The Plant Disease Reporter, August 15, September 1, and September 15, 1935 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 19 (1935), Nos. 13, pp. 216–229, figs. 2; 14, pp. 230–238, fig. 1; 15, pp. 239–248, fig. 1*).—Among other things, data on the current status of the Dutch elm disease and the following items of interest are included in these issues:

No. 13.—Cereal diseases in northern Georgia, including a comparison of the loss in wheat varieties due to leaf rust (*Puccinia rubigo-vera tritici*) and leaf blotch (*Septoria tritici*) in experimental plats at Athens in 1934 and 1935, by J. H. Miller.

No. 14.—The present eelgrass (*Zostera marina*) situation along the American Atlantic coast, by C. Cottam; notes on *Z. marina* in upper Buzzards Bay, Mass., by N. E. Stevens; silver leaf (*Stereum purpureum*) on fruit trees in New York, by E. M. Hildebrand; and *Coryneum beijerinckii* on peach and apricot in Indiana, by R. C. Baines.

No. 15.—Citrus canker (*Bacterium citri*) in Texas; phony peach disease found in Maryland and Kentucky; *Diplodia graminea* in South Carolina, by W. W. Diehl; and occurrence of *Fusarium* wilt of China-aster in Oregon, by F. P. McWhorter.

[Plant pathology in Alabama] (*Alabama Sta. Rpt. 1934, pp. 24, 29, 30*).—Brief reports are included of investigations on the mode of overwintering and seed transmission of *Mycosphaerella* and *Ascochyta* diseases of winter peas and vetches, by J. L. Seal; and the relative susceptibility of table varieties of cowpeas to root knot nematode injury, by C. L. Isbell.

[Plant disease studies in Delaware] (*Delaware Sta. Bul. 192* (*1935*), *pp. 40–49, fig. 1*).—The results are reported of investigations on the following subjects: The transmission of the peach yellows and little peach viruses by myrobalan plum stocks, Japanese and other plums as symptomless carriers of yellows and little peach, and the plum hopper (*Macropsis trimaculata*) as vector of these viruses, all by T. F. and M. M. Manns; and the use of sprays for the control of bacterial spot, scab, and brown rot of peaches, the relation of environmental factors to the downy mildew and leaf blights of cucurbits and a comparison of copper fungicides for the control of downy mildew of cantaloup, the evaluation of different sulfur and copper fungicides alone and in various combinations for the control of apple scab, the development of a new colloidal copper fungicide for the control of diseases of apple, pear, and grape, the evaluation of sulfur particle size and dispersion in relation to fungicidal efficiency, the use of materials of a protective and catalytic nature to reduce injury from lime-sulfur-lead arsenate mixtures, and white root rot, measles, and target canker of apple trees, all by J. F. Adams.

[Plant disease studies in Idaho] (*Idaho Sta. Bul. 217* (*1935*), *pp. 33–35, 43, 44, 46*).—Progress reports are given on breeding and selection for resistance to potato virus diseases, potato tuber indexing work, an epiphytotic of curly top of various crop plants, improvement of quality of beans along with resistance to mosaic by hybridization, pea diseases (root rot and "near wilt", with varietal tests relative to the latter), field tests of bunt resistant and susceptible varieties of wheat in cooperation with the U. S. D. A. Bureau of Plant Industry, studies of the water requirements, root development, and dates of heading and maturity in stripe-rust resistant and susceptible varieties of spring wheat and spring barley, control of leaf curl of peaches and of *Coryneum* on peaches, apricots, and cherries by fall applications of 6–6–50 bordeaux mixture, the fungus "snow scald" of wheat and its control by late seeding and resistant varieties, and final results of tests showing Turkestan and Ladak varieties of alfalfa to be more resistant to bacterial wilt than any others used; a report of good results with tests of the U. S. No. 1 blight (curly top) resistant sugar beet at the Aberdeen Substation; and tests with potatoes at the Sandpoint Substation of varieties resistant to the virus diseases.

[Plant disease investigations in Minnesota, 1885–1935] (*Minnesota Sta. Bul. 319* (*1935*), *pp. 52–56*).—A brief survey is given of the general results of some of the outstanding investigations conducted with particular reference to physiologic specialization among plant parasitic fungi; the nature of varietal resistance to plant diseases; the factors affecting the development of plant disease epidemics; the control of diseases by seed treatment, by removal of alternate hosts, by seed certification methods, and by spraying; the relation of insects to plant diseases; and forest tree diseases and timber decay.

[Plant disease studies in North Carolina] (*North Carolina Sta. Rpt. 1933*, *pp. 22–25, 38–40, 66, 67, 72–74*).—Brief progress reports are given on breeding and selection for resistance to black root rot of tobacco and its control by soil treatments with sulfur, and similar search for varieties resistant to black shank and its control by treatment with various chemicals, both by E. G. Moss and J. J. Bullock; persistence of tobacco-mosaic virus in, and infection from, the soil and its transmission by the tobacco suck fly (*Dicyphus minimus*), by S. G. Lehman; further studies on the control of bacterial wilt of tobacco, tomato, pepper, and potato by sulfur applications to the soil, by R. F. Poole; incidence of, and damage by, blue mold of tobacco and its control by sprays and by temperature control in the seedbeds, by Moss; breeding to obtain strains or varieties of wheat more resistant to leaf and stem rust and at the same time high yielding and suited to North Carolina conditions, by P. H. Kime and Lehman; control of loose smut of barley by various chemical and modified hot-water treatments and the effect of smut and stripe on yields, oat smut control by formaldehyde and by DuBay dust 1100–WW, and breeding for resistance to wheat rust, all by Lehman; incidence and factors influencing bacterial spot of peaches due to *Bacterium pruni* and its control by various sulfur, zinc, and copper-containing spray compounds, the incidence, symptoms, and factors influencing the ring spot disease of sweetpotatoes due to *Pythium ultimum* and its control by harvesting from dry soil and by proper storage, formaldehyde, mercuric chloride, and hot water for control of sweetpotato black rot due to *Ceratostomella fimbriata*, a study of root rot of sweetpotatoes from which several fungi were isolated but which appear to have no etiological relation, and for which no specific control was evident from stem and root treatments with various fungicides or from soil treatments with various inorganic salts, organic fertilizers, and plant products, and the incidence of big root, root knot, or nematode disease of plants, varieties of sweetpotatoes and cowpeas resistant to it, and its control by soil treatments with sulfur, all by Poole.

A leaf spot disease of wheat caused by Helminthosporium tritici-repentis Died, M. Mitra (*Indian Jour. Agr. Sci., 4 (1934), No. 4, pp. 692–700, figs. 2*).—A summary of the species of *Helminthosporium* reported on wheat in various parts of the world is given, including *H. sativum*, *H. bicolor*, and *H. halodes tritici* for India. A fourth species, a strain of *H. tritici repentis* occurring in Pusa and sometimes causing considerable damage to wheat, was isolated and is here recorded for the first time on this host. The symptoms and economic importance of the disease, and the morphology, taxonomy, culture, and pathogenicity of this fungus were studied. Its parasitism to wheat was proved by inoculation tests, and cross inoculations to *Agropyron repens*, the host on which the species was hitherto known to occur, were successful.

Alfalfa wilt control by breeding making remarkable progress, H. M. Tysdal (*U. S. Dept. Agr. Yearbook 1935, pp. 119, 120, fig. 1*).—This is a progress report of a project under way for approximately 6 yr. by the Bureau of Plant Industry in cooperation with various State experiment stations, in which some of the selections already available have almost twice the resistance of the most resistant varieties formerly at hand.

Bacterial wilt of corn combated by use of resistant strains, C. Elliott (*U. S. Dept. Agr. Yearbook 1935, pp. 126–129, figs. 2*).—A general summary is presented of the history and distribution and of the results of investigations of Stewart's disease (*Aplanobacter stewarti*) of corn from 1897 to 1934. Data are presented especially on the heavy damage in recent years, the latest epidemic having followed a succession of mild winters; the overwintering of the causal organism in flea beetles (*Chaetocnema pulicaria*); and on control by the use of disease-free seed and resistant varieties. The breeding of resistant, early-maturing, high-quality strains of sweet corn is one of the most important recent developments.

Nutritional requirements of the root-rot fungus, Phymatotrichum omnivorum, W. N. Ezekiel, J. J. Taubenhaus, and J. F. Fudge (*Plant Physiol., 9 (1934), No. 2, pp. 187–216, figs. 6; abs. in Texas Sta. Circ. 76 (1934), pp. 15, 16*).—In these studies at the Texas Experiment Station, *P. omnivorum* was grown in numerous synthetic culture solutions to determine its nutrient requirements, which were not exacting. The mineral ions utilized were phosphate, K, Mg, and probably sulfate. Other ions were apparently supplied in sufficient quantities as impurities. Nitrogen was utilized equally well from amino acids, peptones, and urea, as well as from inorganic ammonium and nitrate salts. Ammonium nitrate was frequently best. The carbohydrate sources utilized were pentose and hexose monosaccharide sugars, disaccharide sugars, starch, and mannitol. Growth was equally good in various dextrose concentrations. The best growth was obtained in the more alkaline solutions, but it was good at pH 3.7. At pH 3 growth was inhibited. Carrot juice added to the media resulted in large increases in growth. The formula is given of a medium developed especially for production of sclerotia.—(*Courtesy Biol. Abs.*)

Wilt disease of Crotalaria juncea Linn. (sann-hemp), M. Mitra (*Indian Jour. Agr. Sci., 4 (1934), No. 4, pp. 701–714*).—The history and symptoms of wilt of sunn-hemp (*C. juncea*) and the results of studies of the organisms isolated are given. The parasitism of a biologic strain of *Fusarium vasinfectum* was established, and *Rhizoctonia solani* and *Neocosmospora vasinfecta* also were proved capable of causing wilt, but to a minor degree.

The *Fusarium* was noted on the pods and in many cases also on the seeds in affected pods. Since infection may occur during threshing, the use of some such fungicide as Uspulun or mercuric chloride is recommended.

Experimental results showed that the pigeonpea (*Cajanus indicus*) strain of *F. vasinfectum* can induce wilt in sunn-hemp and vice versa, that the cotton strain does not infect pigeonpea or sunn-hemp, and that the pigeonpea and sunn-hemp strains do not infect cotton or *Sesamum indicum*.

The killing of plants by *R. solani* or *N. vasinfecta* occurred mostly in their early stages of growth, while the *Fusarium* wilt appeared later in the season when the temperatures were lower.

The wilt disease started earlier and at higher temperatures in sunn-hemp than in pigeonpea.

The adsorption and elution of cucumber mosaic virus, B. N. Uppal (*Indian Jour. Agr. Sci., 4 (1934), No. 4, pp. 656–662*).—The passage of an extract of this virus through a sand and pulp filter or a bed of fuller's earth inactivated the filtrate, due to adsorption of the virus. It was readily adsorbed when even 0.125 g of kaolin or fuller's earth was added to 100 cc of virus extract. However, adsorption did not necessarily inactivate the virus unless the H-ion concentration was above about pH 5, and there were indications that it is rendered noninfectious in alkaline reactions above pH 9.

The virus could be eluted by changing the pH to the acid side, i. e., to about pH 6–6.7. Elution proved impossible with an ammonia solution. The latter, however, did not inactivate the virus, since a change of the treated suspensions to pH 6.7 reactivated it.

Downy mildew of hops causing serious damage: Control studies under way, A. F. Sievers and F. Rabak (*U. S. Dept. Agr. Yearbook 1935, pp. 169–171, figs. 2*).—This report presents a brief history of hop production in the United States and outlines investigations by the Bureau of Plant Industry on the relation of prevailing methods of production, handling, and storage of hops to the quantity and quality of the soft resins so important in the brewing industry and studies in cooperation with the Oregon Experiment Station on the downy mildew [*Plasmopara humuli*], which has become increasingly prevalent and destructive to cultivated hops in the United States and Canada since 1928. Cool, humid weather favors the development of this mildew. The investigation thus far has dealt largely with practical control measures under these conditions and with the development of varieties of hops resistant to the disease.

Diseases of pan (Piper betle) in the Central Provinces, J. F. Dastur (*Indian Acad. Sci. Proc., 1 (1935), No. 11, Sect. B, pp. 778–815, pls. 3, figs. 19*).—

This paper gives a general account of the soils preferred and of the methods of cultivation practiced for *P. betle* and reports detailed studies on its fungus diseases and on their control. The most important fungus diseases of the region are foot rot and leaf rot due to *Phytophthora parasitica piperina* n. v., foot rot due to *Pythium piperinum* n. sp., and anthracnose due to *Gloeosporium* sp. and *Colletotrichum* spp. *Sclerotium rolfsii*, *Rhizoctonia bataticola*, and *R. solani* were isolated from certain foot rot plants, but it is thought that they are only weakly parasitic and cause little injury to the vines.

The best method for the control of these diseases appeared to be treatment of the ridges with bordeaux mixture 2-2-50 and spraying of the vines once every 2 mo. with bordeaux mixture 2-2-50 or with Bouisol.

Foot-rot disease of Piper betle L. in Bengal, W. McRae (*Indian Jour. Agr. Sci., 4 (1934), No. 4, pp. 585-617, fig. 1*).—In Bengal, betel vines are usually grown in low areas subject to flooding in the monsoon, at which time most of the injury from foot rot diseases occurs. Losses in recent years have reached considerable proportions.

Of the several fungi found associated with the symptoms described, *Rhizoctonia solani*, *Sclerotium rolfsii*, and *Phytophthora parasitica* were proved to be pathogenic. Much of the loss is due to the last, but *S. rolfsii* is relatively unimportant in Bengal. *Glomerella cingulata* caused secondary damage only, as when placed on a lesion due to *Phytophthora*.

These fungi appear to be favored by temperatures of from 20° to 30° C. The preference of *R. solani* for temperatures at the cooler end of the scale agrees with the field observation that the vines suffer from attacks by this fungus only after the rains and in early winter. The thermal death points for *R. solani*, *S. rolfsii*, and *P. parasitica* are 51°, 55°, and 48°, respectively.

Spraying the lower parts of the stem with bordeaux mixture (2.5-2.5-50), beginning before the monsoon and thrice at intervals of a month afterward, controlled the *Phytophthora*, and a weak solution of Kerol the *Rhizoctonia* disease, when done in combination with culture on land above the flood level and the removal of diseased plants.

Investigations on the inheritance of immunity to wart disease (Synchytrium endobioticum (Schilb.) Perc.) in the potato, A. P. Lunden and I. Jørstad (*Jour. Genet., 29 (1934), No. 3, pp. 375-385*).—Immunity to wart disease is shown to be dominant to susceptibility. Self-fertilization of immune varieties gave a 3:1 ratio, showing that they are heterozygous for a single factor, X. The results of crossing different immune varieties can be explained on the following assumptions: There are two different immunity factors, X′ and X″, which produce the same result and may be present together, and, in addition, there are two complementary factors, Y and Z, which together give immunity. All these factors are inherited separately.—(*Courtesy Biol. Abs.*)

The problem of immunity to wart disease (Synchytrium endobioticum (Schilb.) Perc.) in the potato, E. J. Collins (*Ann. Bot. [London], 49 (1935), No. 195, pp. 479-491*).—Six classes of results from a series of wart disease trials on varieties of potatoes—(1) immune, selfed, (2) immune × immune, (3) susceptible, selfed, (4) susceptible × susceptible, (5) immune × susceptible, and (6) susceptible × immune—at Ormskirk, England, made during the period 1918-27, are tabulated, and conclusions are based on cumulative evidence rather than on that obtained by direct and exact breeding of individual varieties. Positive evidence of susceptibility during the first year of trial was accepted, but if no infection was noted the seedling tubers were tested again the following year and no seedling was pronounced immune unless it had escaped infection for two seasons.

The preponderant evidence apparently favors a simplification of the problem of wart disease inheritance rather than a multiplication of immunity factors and of others inhibiting them. Modern commercial varieties must be the result of considerable inbreeding, and many are probably closely related and often the product of a spontaneously set berry taken haphazard. Despite the excellence of the trials here reported, they had the limitations normally associated with experiments dependent on seasonal and soil conditions not under control. It is generally recognized that a laboratory-controlled technic of seedling infection would be desirable, therefore the first results of the kind by Lunden and Jørstad (see above) are considered particularly valuable and their tables were used in modeling the tables here presented.

Suggestions are made as to the applicability of various genetic ratios and comparisons with records by others, but factorial schemes for the genetic constitution of potato varieties are not advanced.

A general summary of experiments with sugarcane, II (*Louisiana Sta. Bul. 267* (*1935*), *pp. 7–12*).—This part summarizes work in Louisiana as follows:

Testing canes for disease resistance in Louisiana, C. W. Edgerton and E. C. Tims (pp. 7–10).—Since the climatic conditions preclude breeding work with sugarcane, Louisiana must depend on other regions for new varieties. Information regarding the relative resistance to the three diseases most important in the State ("stubble deterioration", red rot, and mosaic) is now obtained within 2 yr. by growing the varieties under test in the increase plats before releasing them for general planting.

Since the stubble deterioration is an exceedingly dangerous disease, a method has been devised whereby the relative resistance of a new variety may be determined by comparison of its reactions with those of known susceptible and resistant varieties growing under the same conditions. For conclusions with regard to red rot, stalks must be inoculated under both field and laboratory conditions. With respect to mosaic, information gained over several years suggests that strains possibly comparable to the physiological strains of fungi may occur, and that there are distinct strains which usually produce similar symptoms but which attack certain varieties more readily than others. The percentage of recovery of some varieties from mosaic is very high. Field determinations of susceptibility, the percentage of recovery, the percentage of infection from inoculations with different mosaic types, and the period of incubation are all important factors in the determination of the mosaic resistance of a variety.

It is believed that the system now employed in Louisiana eliminates to a very large extent the selection of seedlings which later might become dangerous.

Disease resistance of commercial canes, E. C. Tims, P. J. Mills, and C. W. Edgerton (pp. 10–12).—Since the crop failures between 1924 and 1927, hundreds of cane varieties and seedlings have been tested under Louisiana conditions. As susceptibility to diseases is one of the most important factors in selection for planting purposes, the authors list the released varieties of cane which have proved resistant or susceptible to the three most important diseases above named. When all the diseases are considered, it is seen from the results of tests and field trials that the newer varieties, C. P. 28–11, C. P. 28–19, C. P. 29–320, and Co. 290, more nearly meet the standards for resistance than do the other varieties tested.

Sugar cane diseases in Uganda, C. G. HANSFORD (*East African Agr. Jour.*, *1* (*1935*), *No. 1*, *pp. 25–28*).—This is a summary of the sugarcane disease situation, including mosaic, red stripe (*Bacterium rubrilineans*), top rot (cause unknown), root diseases (of no importance in Uganda), and leaf spots (*Cercospora* and *Helminthosporium*).

Investigations on downy mildew of tobacco, G. M. Armstrong and C. B. Sumner (*South Carolina Sta. Bul. 303 (1935), pp. 23, figs. 2*).—A short discussion is given of the history and symptoms of the disease caused by *Peronospora tabacina*, and the results of recent investigations in South Carolina are recorded.

Pepper, tomato, and eggplant were infected by inoculation with conidia from tobacco, but the fungus was not found as active on these hosts as on tobacco. Tobacco was infected by conidia taken from pepper.

Conidia were found to germinate at temperatures from 1° to 3° C. up to 29°. Several instances of delayed germination were noted. Viable conidia were found in plant beds at all hours of the day. Numerous unsuccessful attempts were made to germinate oospores. It is shown that spore germination, infection, and sporulation will occur at relative humidities slightly below the dew point. Infection occurred at temperatures from 5° to 30° inclusive; 25° to 26° is the highest temperature at which the production of conidia occurred.

Plants which recovered from the disease were reinfected in several instances though others similarly inoculated failed to show symptoms of the disease. During two winter seasons, plants protected in beds produced conidia periodically.

Experiments on the control of the disease by high temperatures, forced air ventilation, and spraying are presented. Minimum settings of the temperature at 31° in well insulated plant beds gave satisfactory control of the disease. Because of inevitable fluctuations, lower temperatures than 31° are held likely to lead to appreciable damage from the pathogen.

Spraying with calcium monosulfide resulted in a greater reduction of infection than spraying with copper oxide, red copper oxide, or colloidal copper. Although sprayed eight times at 4-day intervals, the suggestions relative to control, made as a result of experience with the disease, include only selection of a warm sunny location for the seedling bed, using a new site or thoroughly disinfected old site; planting more bed space than needed; removing covers during the day as soon as weather will permit to admit sunlight and air; using any practice that will hasten plant growth; transplanting to the field, if possible, before the disease delevops in the bed; and setting out no diseased plants until they have recovered.

The size of the particles in tobacco-mosaic virus [trans. title], H. Bechhold and M. Schlesinger (*Phytopath. Ztschr., 6 1933), No. 6, pp. 627–631*).—The rapidity of sedimentation in the centrifuge, a method which had proved useful in the study of certain virus maladies of animals, was used to determine the absolute size of the active element in tobacco-mosaic virus. Freshly gathered tobacco leaves with well-developed mosaic symptoms were ground in a mortar and diluted from 10 to 15 times with physiologic saline. These suspensions were first centrifuged slowly to remove the coarser particles, and then at from 14,000 to 15,000 revolutions. A plant was then injected with 0.2 cc of each supernatant fluid. From the results thus obtained, it was concluded that sedimentation occurs at a speed indicating that the size of the virus particles is approximately 50 mμ and that they are separated from each other and of uniform size. These particles corresponded in diameter to the medium-sized types of bacteriophage.—(*Courtesy Biol. Abs.*).

A serological estimate of the absolute concentration of tobacco mosaic virus, K. S. Chester (*Science, 82 (1935), No. 2114, p. 17*).—From serological results with tobacco-mosaic virus and on the basis of premises stated, the author estimates the concentration of the virus in expressed virus sap to be no less than from 0.1 to 1 mg per cubic centimeter. Since crude tobacco-mosaic sap diluted to 1–1,000,000 gives about one necrotic lesion per leaf on *Nicotiana glutinosa* and about 0.1 cc of sap dilution is used for the inoculation, and assuming W. J. Robbins' hypothesis of 100,000 for the molecular weight of the virus to be correct, it would follow that 1 cc of virus sap contains from 6.06×10^{14} to 6.06×10^{15} virus molecules and that a single minimal infective dose on this host corresponds to from 60,000,000 to 600,000,000 molecules of virus antigen. Possible reasons for this enormous ratio of molecules to a single infection are noted.

Factors influencing the activity of tobacco mosaic virus preparations, A. W. Petre (*Contrib. Boyce Thompson Inst., 7 (1935), No. 1, pp. 19–28, figs. 2*).—In the procedure previously published by C. G. Vinson and the author[3] for the purification of tobacco-mosaic virus a pigment-free preparation was obtained from the juice of diseased plants by preliminary precipitation with basic lead acetate. In the supernatant liquid the virus was thrown out by neutral lead acetate, and from the latter precipitate pigment was removed by M/3 monopotassium phosphate pH 4.5. From this pigment-free precipitate the virus was removed by M/15 phosphate buffer pH 6.5.

As a result of studies here presented the following improvements in the method are suggested: In the preliminary elution, increasing the concentration of potassium acid phosphate assisted in removing the pigment, and increasing the acidity of this buffer increased the activity of the virus removed in the final eluate but was less effective in removing the pigment. In the final elution, the lead acetate precipitates from the juice of field-grown tobacco plants required an alkaline phosphate buffer of higher pH than 6.5 to demonstrate their full activity. Favorable elution was obtained at pH 7.5 and 8.4.

Tobacco plants grown in glass cages proved less susceptible to infection with tobacco mosaic than those grown in the greenhouse. The increased succulence of the cage-grown plants is presumed to account for the differences in susceptibility. The rate of leaf expansion was found not to be a factor in susceptibility.

Stem rot of tobacco caused by Sclerotinia sclerotiorum (Lib.) De Bary, K. F. Kheswalla (*Indian Jour. Agr. Sci., 4 (1934), No. 4, pp. 663–673, pls. 4*).—A serious stem rot of tobacco in Rangpur, Bengal, proved to be due to *S. sclerotiorum*. The disease symptoms, history of the pathogen, and control measures are discussed. Studies of the pathogenicity, physiology, and cultural characters of the fungus gave the following results:

Infection takes place on wounded stems and through the roots, and can be induced by whole or cut sclerotia on wounded stems, as well as by ascospores on wounded leaves.

In culture, optimum growth occurred at from 20° to 25° C., and growth ceased at 30°. In media rich in nutrients microconidia developed only after the available food supply had been exhausted, and in nutrient-deficient media in a short time.

The fully matured asci and paraphyses of the perfect stage were found. Low temperature proved essential to the development of the apothecial stalks and light for their expansion into disks. No *Botrytis* stage was observed.

Pleospora rot of tomatoes, G. B. Ramsey (*Jour. Agr. Res. [U. S.], 51 (1935), No. 1, pp. 35–43, pls. 2, fig. 1*).—*Pleospora* rot occurs in California tomatoes shipped in November and December and in Mexican tomatoes marketed during January. The inciting organism (*P. lycopersici*) and its conidial stage (*Macrosporium sarcinaeforme*) are usually both present on decaying fruits. Losses as high as from 50 to 90 percent of the tomatoes in some cars have been reported. Decay develops slowly in green tomatoes, but rapidly in turning and ripe fruits. Inoculated tomatoes show little decay below 45° F. or above 80°. The most rapid decay develops at from 65° to 70°. On potato-dextrose agar (pH 4.7 and 6.01) the minimum for growth of the organism was 35°, the optimum 70°, and the maximum 90°. The growth rate was always more rapid on the medium with a pH value (6.01) corresponding to that of the juice of ripe tomatoes than on the one corresponding to that of the juice of mature-green tomatoes (pH 4.7). This harmonizes with the fact that in market tomatoes the most rapid decay occurs in the turning and ripe stages.

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[3] Mosaic disease of tobacco.—II, Activity of the virus precipitated by lead acetate. Contrib. Boyce Thompson Inst., 3 (1931), No. 1, pp. 131–145.

Morphologic studies of Septoria lycopersici, H. A. Harris (*Phytopathology, 25 (1935), No. 8, pp. 790–799, figs. 3*).—The following morphological and developmental features of a strain of *S. lycopersici* isolated from garden-grown tomatoes were elucidated by this study, conducted at the University of Illinois. The mycelium consists of hyaline, thin-walled and of brown, thick-walled types. Pycnidial formation is symphyogenous. The pycnidial cavity forms by schizogenous and lysigenous processes. Ostiole formation occurs by tensional strain of the pycnidial wall on the leaf epidermis and by pressure of the pycnospores on the pycnidial wall. Pycnospore formation occurs by basipetal elongation of the sporogenous cells without intervening conidiophores, the spore becoming separated from the sporogenous cell by a basal constriction. Pycnospores germinate by lateral germ tubes from the inner cells and by apical-cell elongation. Infection penetration is stomatal. The mycelium is intercellular and effects cell penetration by haustoria.—(*Courtesy Biol. Abs.*)

Summary of orchard diseases in Massachusetts in 1933, O. C. Boyd (*Mass. Fruit Growers' Assoc. Rpt., 40 (1934), pp. 74, 76, 77*).—This note from the Massachusetts State College briefly summarizes seasonal disease conditions for apples, pears, and stone fruits.

The fungus flora of apple twigs and branches and its relation to apple fruit spots.—I, Review of literature and preliminary experiments, L. Ogilvie (*Jour. Pomol. and Hort. Sci., 13 (1935), No. 2, pp. 140–148*).—The object of this paper was to call attention to the established cases of connection between twig or branch and fruit infections and to record briefly some observations and experiments bearing on them. The following fungi, parasitic on both living branches and fruit, are discussed: *Venturia inaequalis*, *Glomerella cingulata*, *Phacidiella discolor*, *Fusarium lateritium fructigenum*, *Physalospora cydoniae*, *Neofabraea malicorticis*, *Gloeosporium perennans*, and *Phyllosticta solitaria*. The following, saprophytic on dead twigs and branches, are also reported as infecting apple fruits: *G. album*, *Alternaria* spp., *Botrytis cinerea*, and *Diaporthe perniciosa*. Other sources of fruit infection and orchard control measures in general are also discussed.

Decane ring-spot of apple leaves, and symptoms of decane injury in apple, potato, and onion, P. A. Young (*Amer. Jour. Bot., 22 (1935), No. 7, pp. 629–634, pl. 1*).—This contribution from the Montana Experiment Station describes injury to apple leaves and twigs and to potato leaves from applying synthetic *n*-decane in drops to the underside of the foliage. This material is one of the toxic constituents of petroleum oils.

"Apple rust, up to date", E. F. Guba (*Mass. Fruit Growers' Assoc. Rpt., 40 (1934), pp. 48–52*).—In this contribution from the Massachusetts State College, the author summarizes present knowledge, including his own observations during the preceding 8 yr., relative to the distribution, injuriousness, and control of apple rust, with special reference to Massachusetts conditions.

Phony peach disease control is promoted by destroying wild peach trees, W. F. Turner (*U. S. Dept. Agr. Yearbook 1935, pp. 275–277*).—An account is given of an intensive compaign for the eradication of diseased wild peach trees recently carried out in Georgia and Alabama.

A Phytophthora disease of peach seedlings, J. C. Dunegan (*Phytopathology, 25 (1935), No. 8, pp. 800–809, figs. 2*).—This paper reports the results of a cooperative study by the Arkansas Experiment Station and the U. S. D. A. Bureau of Plant Industry of a disease of peach seedlings in northwestern Arkansas, differing in several respects from somewhat similar diseases previously reported by others. It is characterized by the formation of a canker on the succulent stems, followed by a red discoloration and rolling of the terminal leaves, and, finally, by the wilting and death of the young trees in the nursery rows.

From the cankers, appearing well above the soil line, a fungus identified as *P. cactorum* was readily isolated and its pathogenicity proved in a series of inoculation tests in which the disease was reproduced experimentally. The fungus was found to invade the cortex and cambium tissues. Gum pockets are formed in the region of the phloem, while the outer parenchyma tissues collapse into a dark, discolored mass resting on the cortical fibers.

The prevalence of the disease is correlated with periods of excessive rainfall and cloudy weather during the early part of the growing season. Thus far the only practical control measure has been to grow the seedlings in well-drained sites.

In pure culture the fungus grows readily on standard media, producing papillate sporangia from 30μ to 45μ long and from 24μ to 36μ in diameter sympodially on slender sporangiophores. Antheridia, oogonia, and oospores develop profusely on corn meal agar and lima bean agar. The oogonia are subspherical, from 32μ to 38μ in diameter; the oospores are thick walled, from 25μ to 30μ in diameter; and the antheridia, which vary in shape from curved tubes to spherical bodies, are predominantly paragynous. The organism grows slowly at 5° C. and vigorously at from 21° to 26°, but is inhibited at 32°. On a synthetic medium the fungus grew at from pH 4.0 to 9.0.—(*Courtesy Biol. Abs.*)

A note on the recovery from silver-leaf disease of plum trees on common plum and myrobolan stocks, respectively, F. T. Brooks and G. H. Brenchley (*Jour. Pomol. and Hort. Sci., 13 (1935), No. 2, pp. 135–139*).—This note records the results of grafting and budding of plums of the Victoria variety on myrobolan B (13 trees) and on common plum (15 trees) stocks, followed, when the trees were 5 yr. old, by inoculating 3 of the larger shoots on each tree with *Stereum purpureum*. Three mo. after inoculation these shoots were all silvered to about the same degree. Four yr. later the number of trees killed by silver leaf, silvered, and healthy were, respectively, (1) for the trees on myrobolan B, 4, 7, and 2, and (2) for those on common plum, 0, 3, and 12. Although the high rate of recovery on the latter stock was probably related to the hot, dry summers of the last 2 yr., the difference in the course of the disease on the 2 stocks may be significant. It is thought that only by the accumulation of such data that any definite statement can be made ultimately as to the influence of the stock on the incidence of this disease of plum trees.

Seasonal relationship of dead twigs of citrus to stem-end rot, J. J. Taubenhaus (*Ann. Tex. Citrus Inst. Proc., 3 (1934), pp. 89–93; abs. in Texas Sta. Circ. 76 (1934), p. 21*).—Stem-end rot (*Diaporthe citri* and *Diplodia natalensis*) was prevalent in the lower Rio Grande Valley during 1930–31. Both fungi were consistently isolated from dead citrus twigs and from the rinds of grapefruits with stem-end rot. *Colletotrichum gloeosporioides* and

Septoria citri were also recovered from this material. Inoculations of the latter into fruits caused a weak decay, of the former a typical anthracnose. *Diaporthe citri* and *Diplodia natalensis* produced typical stem-end rot in inoculated grapefruits.

The results of these preliminary studies at the Texas Experiment Station appear to indicate a definite relationship between the presence of dead citrus twigs and the later prevalence of stem-end rot in an orchard.

Root diseases of citrus, W. J. Bach (*Ann. Tex. Citrus Inst. Proc., 3 (1934), pp. 39–46*).—This paper from the Texas Experiment Station briefly summarizes the present knowledge of citrus root diseases, with special reference to cotton root rot (*Phymatotrichum omnivorum*), foot rot or mal di gomma, and water injury.

Observations on coffee in Kenya.—I, Chlorosis and die-back in coffee, V. A. Beckley (*Empire Jour. Expt. Agr., 3 (1935), No. 11, pp. 203–209, pls. 2*).—Four forms of chlorosis are described. One, ascribed to nitrogen deficiency at the period of maximum demand, is usually accompanied by die-back and involves severe loss of crop, but the roots do not die. Nitrogen applications arrest both the die-back and the loss in yield.

A second form, due to carbohydrate deficiency, is accompanied by severe die-back of both branches and roots, but a fair crop is usually obtained. This form is not influenced by nitrogen applications unless made very early.

In one of the 2 other forms recognized the terminal leaves are an even bright yellow and in extreme cases malformed and twisted. In the other the veins remain dark green against a yellow background. Thus far, it has been impossible to attribute these forms to any definite causes.

An introduction by A. D. Trench and the author is given.

The morphology, physiology, and mode of parasitism of a species of Chalaropsis infecting nursery walnut trees, J. B. Hamond (*Jour. Pomol. and Hort. Sci., 13 (1935), No. 2, pp. 81–107, pls. 4*).—The constant appearance at East Malling Research Station, England, of a fungus with two spore forms on young walnut trees failing to grow after grafting suggested a causal relation. It was isolated in pure culture, its relation to the disease investigated, its morphological and cultural characters studied, and the genetic connection of the two spore forms established. It was identified as *C. thielavioides*.

Three other strains of *Chalaropsis* and a species of *Thielaviopsis* were also cultured and their morphological and cultural characters compared.

The appearance of spontaneously infected walnut tissues and the distribution of the fungus therein are described. Inoculations on walnut grafts were successful, and definite evidence is given of the etiological relation of the fungus. A strain from carrots proved the most virulent for this host.

Laboratory control tests proved that low concentrations of formalin are toxic to *Chalaropsis*. This is now generally used as a control measure.

The fungus apparently occurs not only in England but also in Italy, Scotland, France, and Australia.

Smoke injury to shade trees, O. E. Jennings (*Natl. Shade Tree Conf. Proc., 10 (1934), pp. 44–48*).—This paper consists of general notes on these injuries.

Elm diseases in Illinois, L. R. Tehon (*Natl. Shade Tree Conf. Proc., 10 (1934), pp. 105–111*).—This paper discusses the ecological location of the State, the history of elm-disease investigations there, and the inception of the present study of elm diseases in relation to nurseries and to shade trees in cities and gives a survey of the general findings as to the causes of these diseases. They comprise the true wilt group, including *Cephalosporium*, *Verticillium*, and *Phomopsis*, named in the order of their importance; the die-back group, including two types of *Coniothyrium*, three types of *Phoma*, a species each of *Diplo-*

dia, *Sphaeropsis*, and *Vermicularia*, and a canker-producing form each of *Cytospora* and *Cytosporina;* and a third rather ill-defined group, including a large list of root and trunk diseases from which *Xylaria polymorpha* is the most common fungus thus far isolated. Notes are added on the incidence of these diseases and on the injuries caused.

Dutch elm disease must be eradicated to save American elm, L. H. Worthley (*U. S. Dept. Agr. Yearbook 1935, pp. 174–177, fig. 1*).—This report gives a brief history of the introduction and spread of the Dutch elm disease (*Ceratostomella ulmi*) in the United States and discusses its effects there and in Europe. The only hope of preserving the elms in the United States rests on eradication, which, it is thought, may be possible through an immediate, adequate, long-term program. The causal fungus, the symptoms induced, and the methods of harboring and dissemination of the parasite are briefly described, and a map shows in detail the extent of the principal area known to be invaded, as of October 24, 1934.

Slime flux, E. F. Guba (*Natl. Shade Tree Conf. Proc., 10 (1934), pp. 56–60*).—This paper from the Massachusetts State College gives a general account of the present knowledge, including the author's observations, on this disease of shade trees to which elms are consistently most susceptible. The slime fluxes are grouped and discussed according to the color, nature, and source of the exudate. The plant and animal populations of the flux appear to have no importance in the etiology of the disease, which is purely physiological in origin and always preceded by injuries to the tree. Declining vigor due to the diminishing supply of soil nutrients in shade-tree plantings also often appears to be a contributing factor. Measures for the control of the various types of slime flux are also discussed.

Fusarium strains in relation to wilt of China aster, R. S. Riker and L. R. Jones (*Phytopathology, 25 (1935), No. 8, pp. 733–747, figs. 2*).—In continuation of studies at the Wisconsin Experiment Station, previously reported (E. S. R., 66, p. 752), pathogenicity tests with 10 Fusaria (section *Elegans*) inducing wilt on other hosts gave negative results with China-aster. Similar tests with 27 strains isolated from wilting asters showed that (1) some were pathogenic to aster, while others were not; (2) most of the pathogenic forms belonged to the section *Elegans*, but *Fusarium lateritium fructigenum* did not; and (3) not all Fusaria of this section isolated from diseased asters were pathogenic to aster.

Fusaria closely related morphologically and culturally (varieties of the same species) differed in their ability to cause wilt of aster.

F. conglutinans majus, *F. oxysporum* form 6, and *F. lateritium fructigenum*, all pathogenic to aster but, according to standard methods, classified as different varieties or species or even in a different section, induced a wilt of aster essentially similar to that due to the type strain of *F. conglutinans callistephi*. This was true for most isolations of these Fusaria tested both as to general symptoms induced and as to relative pathogenicity. Asters both susceptible and resistant to the W. S. Beach and the A. B. Jackson isolations of *F. conglutinans callistephi* proved susceptible and resistant, respectively, to a number of these other Fusaria.

Of the two exceptions to this agreement in relative pathogenicity, the one from Indiana was identified by H. W. Wollenweber as *F. conglutinans majus;* the other from Japan as *F. oxysporum* form 6. These two isolations caused as much wilt among the aster strains resistant to the Beach and Jackson isolations of *F. conglutinans callistephi* as among the susceptible ones. Isolations of each of these Fusaria from other sources behaved essentially like the Beach isolation.

Thus, the evidence seems to justify the conclusion that the morphological and cultural characters of the Fusaria associated with aster wilt are an unreliable index of pathogenicity, and that essentially the same type of aster wilt may result from the attack of Fusaria classified as of different varieties, species, or sections. Furthermore, the results are fully convincing that aster-wilt Fusaria occur to which the Wisconsin selected aster strains are highly susceptible. However, the general experience with vascular Fusaria favors the expectation that aster strains may be found which will prove adequately resistant to this type of pathogen.

A Sclerotinia rot of Hibiscus sabdariffa Linn, B. B. MUNDKUR (*Indian Jour. Agr. Sci., 4 (1934), No. 4, pp. 758–778, pls. 3, fig. 1*).—During the winter of 1930–31 the seed crop of *H. sabdariffa* at Pusa became seriously affected with a stem rot shown to be due to *S. sclerotiorum*. From August through November the sclerotia were unable to induce the disease, but during December and January they caused infection when the host tissues were injured at the time of application. Ascospores were able to cause infection on both injured and uninjured tissues during November and succeeding months, but the perfect stage of the fungus is not developed until cool temperatures (around 22° C.) are attained.

The cardinal points for the growth of the fungus are apparently around 8°, 22°, and 32.5°. If immersed in water the sclerotia are killed in 5 min. at from 48° to 50°, but not by dry heat even as high as 60°.

Experiments indicated that the sclerotia and mycelia in the soil cannot cause direct infection, that the sclerotia are a potential danger only when they develop apothecia, and that they do not form apothecia when buried at depths of more than 1 in. in the soil. Therefore, hand picking of the sclerotia from the seed and deep plowing to bury them are recommended as measures for control.

Chlorosis of Hydrangea hortensis, G. H. POESCH (*Ohio Sta. Bimo. Bul. 175 (1935), pp. 142, 143, fig. 1*).—Chlorotic plants growing in soil with neutral reaction responded to applications of ferrous and ferric sulfate. The ferrous form gave quicker response. It was applied either in dry form, 0.8 g per week for 4 weeks, or in liquid form, 4 oz. to 5 gal. of water, 1 pt. per week for each plant. Manganous sulfate and zinc sulfate were not effective.

A disease of rhododendrons [trans. title], J. BARTHELET (*Rev. Path. Vég. et Ent. Agr., 21 (1934), No. 2–3, pp. 31–35, pls. 3*).—Under favorable conditions of humidity and temperature, hybrid rhododendrons are attacked by a species of *Phytophthora*. This paper reports studies of an outbreak in 1932 in a shaded portion of a nursery in central France.

Symptoms of the disease induced as it attacks the lower branches and stems and the terminal buds are described. Isolated in pure culture, the fungus grew well on the usual media, but particularly so on Quaker Oats, prune, and grape-must agars. Descriptions are given of the fungus and of its cultural characters, and its developmental stages are figured. The characters of the species—e. g., paragynous antheridia and well-developed papillae on the sporangia—approached those of *P. cactorum*, although the dimensions of the oospores were somewhat greater than indicated by K. S. Chester[3] in his monopragph of the *Phytophthora* parasites of lilac.

All measures contributing to aeration and diminution of the humidity around the plants lessened the spread of the disease. The fungus is apparently widely distributed, and its development is favored by high humidity and temperature. This explains its increased development during the summer in sheltered nurseries.

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[3] Jour. Arnold Arboretum, 13 (1932), No. 2, pp. 232–269, pls. 2, fig. 1.

Acquired immunity from cucumber mosaic in zinnia, W. C. PRICE (*Phytopathology, 25 (1935), No. 8, pp. 776–789, figs. 4*).—Yellow strains No. 6 of cucumber-mosaic virus and No. 302A of tobacco-mosaic virus were found to produce necrotic primary lesions in *Zinnia elegans*, the variety used being Lilliput Golden Gem. Zinnia plants mottled by any one of four different mottling strains of cucumber-mosaic virus became immune to strain No. 6 but were still susceptible to strain No. 302A virus. Moreover, zinnia plants mottled by tobacco-mosaic or aucuba-mosaic viruses were immune to strain No. 302A but did not become immune to strain No. 6. On the other hand, plants infected with tobacco ring spot, yellow ring spot, or severe-etch viruses, did not acquire immunity to either strain No. 6 or strain No. 302A virus.

The mechanism by which this immunity is developed was not revealed, but it was shown that it is associated with the presence of the protecting viruses in the tissue areas acquiring the immunity, and that it is specific. These differences in immune reactions are admirably adapted to cross-immunity studies and enable severe tests to be made of the specificity of such reactions. Furthermore, since *Zinnia* is susceptible to a number of different virus diseases, an extension of these studies on differentiation and classification of viruses now becomes possible.—(*Courtesy Biol. Abs.*)

The status of white pine blister rust control, S. B. FRACKER (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., 1934, pp. 20, pls. 29*).—This mimeographed report summarizes the Federal white pine blister rust control program and includes discussions of the value of the white pines involved; the damage which blister rust does or is capable of doing; the methods, costs, and effectiveness of control measures and the progress already made; and the amount of work yet remaining to be done and the ways and means of carrying it out. Maps indicate the distribution of white pines and of the blister rust in the United States and the progress of blister rust control in various sections, and graphs show the occurrence of the disease in protected v. unprotected areas, its occurrence before and after standard *Ribes* eradication, the present status of *Ribes* eradication, progress in control of the disease, and the land ownership within control areas.

Lumber and log stains can be controlled by chemical treatments, R. M. LINDGREN (*U. S. Dept. Agr. Yearbook 1935, pp. 249–251, fig. 1*).—As a result of tests conducted since 1928, the pine and hardwood industries have been provided with cheap and efficient treatments. Low concentrations of an organic mercury compound and a mixture of chlorinated phenols in water have proved effective on both pine and hardwoods and a saturated solution of borax on hardwoods but not on pine. Similar types of chemical antiseptics have also proved efficient in reducing fungus deterioration of stored logs.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Fauna of the national parks of the United States: Wildlife management in the national parks, G. M. WRIGHT and B. H. THOMPSON (*U. S. Dept. Int., Natl. Park Serv., Fauna Ser. No. 2 (1935), pp. VIII+142, figs. 61*).—Part 1 of this work deals with the perpetuation and utilization of primitive wildlife values (pp. 1–55); part 2 with the present status of national parks wildlife and the restoration program (pp. 57–133).

[Contributions from the U. S. D. A. Bureau of Biological Survey] (*U. S. Dept. Agr. Yearbook 1935, pp. 140–143, 218–223, 284–286, 326–331, fig. 1*).—Practical contributions are presented as follows: **Botulism Is a Factor in**

the Decrease of Western Waterfowl, by E. R. Kalmbach (pp. 140–143) (E. S. R., 71, p. 705); Fur Scarcity Through Overtrapping Impends—Conservation Needed, by F. G. Ashbrook (pp. 218–220); Game as a Farm Crop Emphasized by Agricultural Adjustment, by H. P. Sheldon (pp. 220, 221); Game Management and Forest Protection Are Related Tasks, by E. A. Goldman (pp. 221–223); Predators and Rodents Are Factors in the Spread of Disease, by A. M. Day and J. E. Shillinger (pp. 284–286); Waterfowl Breeding Grounds of Far North Now Poorly Tenanted, by E. A. Preble (pp. 326–328); Waterfowl Problems Clarified by Study of Gunning Practices, by C. Cottam (pp. 328–330); and Waterfowl-Restoration Program Undertaken by the Government, by R. Dieffenbach (pp. 330, 331).

Alaska-Yukon caribou, O. J. Murie (*U. S. Dept. Agr., Bur. Biol. Survey, North Amer. Fauna 54 (1935), pp. 93, pls. 10, figs. 16*).—This work deals with the caribou in relation to man and the status and abundance of caribou, presents a general description, and discusses the general habits and temperament, breeding habits, food habits, migratory habit, habitat, distribution and migration of herds, taxonomic status of Alaska-Yukon caribou, and the caribou of British Columbia and Alberta. A bibliography of 7 pages and an index are included.

Food habits of Mid-West foxes, P. L. Errington (*Jour. Mammal., 16 (1935), No. 3, pp. 192–200*).—This contribution from the Iowa Experiment Station reports upon examinations made of the stomachs of 236 Wisconsin and Iowa red foxes (*Vulpes fulva*) and gray foxes (*Urocyon cinereoargenteus*), collected items from 113 Iowa red fox breeding dens, and 1,175 Iowa red fox spring and summer fecal samples extending over a period of 5 yr. (1929–34). A tabular comparison is given of the incidence of prey species in 910 specimens at dens and in 1,175 fecal samples.

A preliminary investigation on the ecology of the common mole Talpa europea, J. Ford (*Jour. Anim. Ecol., 4 (1935), No. 1, pp. 88, 89*).—The stomach contents of moles collected at Oxford, England, were found to consist almost entirely of earthworms, whereas on Ilsley Down, Berkshire, where there is light shallow soil overlying chalk and there are very few worms, over 90 percent of the stomach contents were composed of insect larvae and centipedes.

The marsh rabbit: An incomplete life history, I. R. Tomkins (*Jour. Mammal., 16 (1935), No. 3, pp. 201–205, pl. 1*).—A study of the habits of *Sylvilagus palustris* along the lower Savannah River in Georgia is reported upon. The evidence obtained indicates that this species is a distinct asset, being used as food, with little damage to gardens, crops, or fruit trees, largely because the land occupied is uncultivated.

[The migration of shore birds in Iowa] (*Iowa State Col. Jour. Sci., 9 (1935), No. 4, pp. 609–616, figs. 4; 617–624, fig. 1*).—These contributions from the Iowa Experiment Station on the 1934 migrations of shore birds through Clay and Palo Alto Counties, Iowa, that in the spring by L. J. Bennett and that in the fall by G. B. Spawn, are based upon observations in the northwestern part of the State.

Bob-white winter survival on experimentally shot and unshot areas, P. L. Errington and F. N. Hamerstrom, Jr. (*Iowa State Col. Jour. Sci., 9 (1935), No. 4, pp. 625–639*).—In continuation of earlier studies (E. S. R., 71, pp. 216, 664; 72, p. 804) at the Iowa Experiment Station, the authors report upon cooperative experiments conducted during the completely closed season of 1933 on 14 selected official game management areas where some carefully controlled shooting in late November and early December was permitted.

"Quail populations surviving the shooting lost 10.3 percent of their numbers collectively during the period of observation. Quail populations on the 4 reliable Iowa unshot areas, comparable in location and period of observation to those shot, lost 28.3 percent. Predator populations were not noted to differ significantly on the Iowa experimental areas, shot or unshot. Mortality seemed to be greatly accelerated in early November, coincident with the reduction of carrying capacity by the drying up of herbaceous vegetation and the falling of leaves from deciduous brush. The first postshooting censuses showed fewer birds than the figure obtained by subtracting the known toll from the preshooting population."

The data appear to confirm the population vulnerability thesis (E. S. R., 71, p. 664) in that they indicate heavy predation upon the exposed surpluses of the unshot areas, while those areas from which the surplus was artificially removed showed a lower loss-rate.

The American eagle: A study in natural and civil history, F. H. Herrick (*New York and London: D. Appleton-Century Co., 1934, pp. XX+267,* [*pls. 32*], *figs.* [*24*]).—A comprehensive account of the biology and general natural history of the American eagle, supplemented by a sketch of the part eagles have played in the history of mankind from antiquity to the present time.

Wild turkey management, H. L. Stoddard (*Thomasville, Ga.: Coop. Quail Study Assoc., 1935, pp. 11; also in Amer. Game, 24* (*1935*), *No. 2, pp. 22, 29, 30, figs. 2*).—An outline is given of wild turkey management as at present conducted in the Coastal Plain region of the South Atlantic and Gulf States (E. S. R., 73, p. 638). A few observations are said to have been made on turkeys elsewhere.

Several unidentified species of both roundworms and tapeworms have been found in wild turkeys examined in the Thomasville, Ga., region, although no birds were examined in which parasitism appeared important. Several species of ticks and lice also are said to be present usually on the birds. The only disease noted among wild turkeys living a free life in the wild is blackhead, which seems to be potentially as dangerous to them in the wild as in captivity. During 1933 one bird and in 1934 three birds which were either found dead or so weakened as to be easily captured by hand from the heaviest stocked range of the Thomasville area were examined and all found to be typical cases of blackhead. It is thought probable that the disease in these cases was acquired from contact with domestic turkeys or free-ranging chickens.

It is pointed out that in a state of nature wild birds appear to draw their food supply from a wide variety of sources; they appear to tolerate a wider range of cover conditions than do quail, being found in either upland or lowland forest types of either evergreen or deciduous trees, as well as in various combinations of the two. During the summer both young and old draw heavily on a wide variety of insects and other animal life, as well as on such fruits as blackberry, dewberry, and huckleberry, as the country affords. They also eat the seeds of various grasses at this season, stripping the heads of ripening seeds of beardless nonirritating kinds.

It is pointed out that controlled burning is an important factor in their management, being an aid in the control of ticks, chiggers, and other parasites and diseases of these birds, as in the case of quail (E. S. R., 65, p. 544; 73, p. 338).

The reptiles of China, C. H. Pope (*New York: Amer. Mus. Nat. Hist., 1935, pp. LII+604, pls.* [28], *figs.* [77]).—Part 1 of this work consists of a general introduction dealing with herpetological collecting in China and the method followed in a systematic account (pp. 1–16); part 2 of a systematic account by species and subspecies, 158 in number (pp. 17–424); part 3 of a résumé of the natural history of Chinese snakes, including a list of species and subspecies by Provinces (pp. 425–453); part 4 of an annotated check list of Chinese lizards (pp. 455–487); and part 5 of appendixes, including a map and list of localities, a bibliography of 39 pages, plates and captions, and an index (pp. 489–604).

Studies on the venoms of North American pit vipers, T. S. GITHENS (*Jour. Immunol., 29 (1935), No. 2, pp. 165–173*).—Tables are given which show the yield of dry venom per snake in milligrams and the toxicity of such venom in milligrams to 350-g pigeons when administered intravenously.

Reproduction in the eastern box-turtle Terrapene carolina carolina (Linné), H. E. EWING (*Copeia, No. 2 (1933), pp. 95, 96*).—Observations of the oviposition, incubation, etc., of the box turtle in 1930 and 1931 are reported upon, the details being given in tabular form.

Further notes on the reproduction of the eastern box-turtle Terrapene carolina (Linné), H. E. EWING (*Copeia, No. 2 (1935), p. 102*).—Observations in 1933 and 1934 in continuation of those above noted are reported upon.

Stream-improvement work in the national forests to develop better fishing, H. C. HILTON (*U. S. Dept. Agr. Yearbook 1935, pp. 309–311, figs. 2*).—This is a practical contribution from the Forest Service.

Intestinal parasites of English sparrows in Illinois, S. H. HOPKINS and E. WHEATON (*Jour. Parasitol., 21 (1935), No. 4, pp. 316, 317*).—The authors report upon the results of a study of the parasites of 131 individuals of the English sparrow trapped in Champaign-Urbana and St. Joseph, Ill.

The incidence of infection was 6.9 percent for cestodes and 33.6 percent for coccidia. Of the 85 birds caught near the yards of the animal pathology department, University of Illinois, where diseased poultry and other animals are confined, 38.8 percent were infected with coccidia, while 24 percent of the 46 birds caught elsewhere harbored coccidia. All of the coccidia were found in scrapings from the intestinal mucosa; they were identified as *Isospora*, but the species was not determined. All of the 9 cestodes found were identified as *Choanotaenia passerina* (Fuhrmann 1907). This species apparently has not been found previously in North America.

Active immunity in rabbits to the liver fluke, Fasciola hepatica, K. B. KERR and O. L. PETKOVICH (*Jour. Parasitol., 21 (1935), No. 4, pp. 319, 320*).—The authors' findings seem to indicate that it is possible to establish an immunity in rabbits subjected to injections of dried fluke material.

The second ecdysis of infective nematode larvae, G. LAPAGE (*Parasitology, 27 (1935), No. 2, pp. 186–206, figs. 6*).—The observations here reported relate to *Haemonchus contortus*, *Ostertagia circumcincta*, and *Trichostrongylus* spp.

An unidentified nematode from the eye of the moose Alces americana, G. DIKMANS and E. E. WEHR (*Helminthol. Soc. Wash. Proc., 2 (1935), No. 1, p. 57*).—This note relates to two nematodes collected from the eyes of moose in northern Minnesota.

Survival of horse strongyle eggs under anerobic conditions, J. T. LUCKER (*Helminthol. Soc. Wash. Proc., 2 (1935), No. 1, pp. 54, 55*).—The data presented show that "horse strongyle eggs submerged for 63 days in a dilute mixture of feces and water at depths varying from about 5.5 to 8 ft. failed to yield infective larvae when cultured in a medium of charcoal and feces, although 0.016 percent of the eggs isolated from another portion of the same sludge sample hatched subsequently in water culture. Two of the 4 eggs which hatched in the latter medium yielded infective larvae. A few infective larvae were found in solid cultures prepared from eggs submerged at these depths for 45 and 53 days, respectively. Following submergence for 41 days at a depth of 24 in., the proportion of eggs which hatched in a water culture and the number of larvae found in a solid culture medium were significantly greater than in the case involving submergence of the eggs for 45 days at greater depths. After submergence for 1 mo. (experiment 2) a majority of eggs were still viable, and considerable numbers of larvae were recovered in a solid culture medium."

Directory of the Bureau of Entomology and Plant Quarantine, 1935 (*U. S. Dept. Agr., Misc. Pub. 220 (1935), pp. 88, fig. 1*).—This pocket directory gives a brief statement of the functions of the Bureau and its several divisions, with the names and addresses of the administrative leaders. A list of laboratories, offices, and field headquarters is arranged alphabetically by States and, in addition to the name of the man in charge and the address, a brief statement is given of the work conducted in each case. A personnel index and a division index are given on the last pages of the directory.

[Contributions from the U. S. D. A. Bureau of Entomology and Plant Quarantine] (*U. S. Dept. Agr. Yearbook 1935, pp. 129–133, 143–145, 147–149, 227–229, 244–246, 259, 260, 263–266, 269, 270, 291–294, 321–323, figs. 9*).—Practical contributions are presented as follows: Bark Beetle Control in Western Forests Aided by Work of C. C. C. Camps, by J. M. Miller (pp. 129–131); Beech Scale Scouting Reveals Infestations in Four New England States [Maine (8 Counties), New Hampshire (2 Counties), Massachusetts (4 Counties), and Connecticut (1 Town)], by C. W. Collins and R. C. Brown (pp. 131–133); Brown-Tail-Moth Control Work under C. W. A. Greatly Reduces Abundance of Pest, by A. F. Burgess (pp. 143–145); Chinch Bug Campaign Successful in Protecting Corn from First Brood, by P. N. Annand (pp. 147–149); Grasshopper Control Accomplished under Cooperative Program, by J. R. Parker (pp. 227–229); Lead Arsenate Substitutes Still Sought for the Control of Fruit Insects, by B. A. Porter (pp. 244–246); Mexican Fruit Fly Spread Is Prevented by Strict Quarantine Enforcement, by P. A. Hoidale (pp. 259, 260); Mosquito-Control Work under C. W. A. Project Brings Many Benefits, by F. C. Bishopp (pp. 263–266); Parlatoria Date Scale Nears Extermination in Cooperative Campaign, by B. L. Boyden (pp. 269, 270); Screw-Worm Invasion of South Necessitates Modified Farm Practices, by F. C. Bishopp (pp. 291–294); and Vegetable Insects Can Be Controlled without Arsenical-Residue Hazard, by D. J. Caffrey (pp. 321–323).

[Work with economic insects by the Alabama Station] (*Alabama Sta. Rpt. 1934, pp. 26, 27, 28*).—In this report (E. S. R., 73, p. 71) brief reference is made to the control of citrus insects with oil emulsions, by L. L. English; the speed of decomposition of arsenical insecticides in phosphate buffer solutions, by H. S. Swingle; the vegetable weevil, by J. M. Robinson; the pecan weevil, by Swingle; and the life history and control of the cowpea curculio, by F. S. Arant.

[Work in economic entomology by the Delaware Station] (*Delaware Sta. Bul. 192 (1935), pp. 28–37*).—Following a brief reference to the important insects of the year, by L. A. Stearns (E. S. R., 71, p. 667), tick control work under the CWA project and mosquito investigations, both by Stearns and D. MacCreary; the bionomics and control of the codling moth, the grape leaf hopper, the grape berry moth, and the oriental fruit moth, all by Stearns, MacCreary, and W. R. Haden; a study to determine the factors responsible for the development of one and two annual broods of the plum curculio, by Stearns; and the biology and control of the Tabanidae of Delaware, by MacCreary, are briefly reported upon.

[Report of work in entomology by the Idaho Station] (*Idaho Sta. Bul. 217 (1935), pp. 27–29*).—This report refers briefly (E. S. R., 72, p. 74) to work with oil sprays and other new measures for control of the codling moth; injury by thrips to onions; control of wireworms in the pupal stage by plowing; the introduction of *Ascogaster carpocapsae* for the control of the codling moth and of *Macrocentrus ancylivorus*, a primary parasite of the strawberry leaf roller and a possible parasite of the *Mineola* moth (*M. scitulella*); border plantings as an aid in pea weevil control; and spray spreaders.

Entomology and economic zoology (*Minnesota Sta. Bul. 319 (1935), pp. 40–43*).—An account of work in this field by the station since 1888, considered under the headings of war on insect pests, methods of control worked out, and animal parasites.

[Report of work in economic entomology by the North Carolina Station] (*North Carolina Sta. Rpt. 1933, pp. 26, 27, 35–37, 44, 62–64, 75, 82, 83*).—The work of the year briefly referred to (E. S. R., 70, p. 803) includes that with the tobacco seed bed midge *Smittia aterrimus* Meig. and its control, the protection of stored ear corn against the rice weevil, the protection of corn against the corn ear worm, and the protection of peanuts against the potato leaf hopper, all by B. B. Fulton; the wintering of bees and a survey of honey-producing plants of the State, both by F. B. Meacham; the bees of the State, by T. B. Mitchell; the harlequin bug, by Fulton; the genetics of *Habrobracon juglandis*, by C. H. Bostian; and the taxonomy and biology of the leaf-cutter bees, by Mitchell.

[Reports on economic insects in Hawaii, 1932, 1933, and 1934], C. E. PEMBERTON (*Hawaii. Sugar Planters' Assoc., Rpts. Expt. Sta. Com. 1932 pp. 18–22; 1933, pp. 14–19; 1934, pp. 19–26*).—Reports of the occurrence of and work with insects, particularly sugarcane, and their control in Hawaii are given for the years 1932–34 (E. S. R., 68, p. 498).

[Contributions on economic insects and insect control] (*Jour. Southeast. Agr. Col., Wye, Kent, No. 36 (1935), pp. 86–99, 103–118, fig. 1*).—The contributions presented include the following: Studies on the Ovicidal Action of Winter Washes—1934 Trials (pp. 86–94) and Bordeaux Mixture-Nicotine Combinations against Aphis and Apple Scab (pp. 95–99), both by M. D. Austin, S. G. Jary, and H. Martin; Investigations on the Insect and Allied Pests of Cultivated Mushrooms, IV, V, by M. D. Austin and S. G. Jary (pp. 103–110) (E. S. R., 72, p. 502); and Pears—Their Pollination, the Relative Order of Flowering of Varieties, Their Cross Fertilization, and the Insect Visitors to the Blossoms, by C. H. Hooper (pp. 111–118).

[Contributions on economic insects] (*Bol. Lab. Zool. Gen. e Agr. R. Ist. Super. Agr. Portici, 28 (1935), pp. 11–36, 70–151, 159–191, 197–209, 290–308, figs. 46*).—Among the contributions presented are the following: A First Contribution to the Knowledge of Some Insect Enemies of Broom Rape (*Orobanche speciosa* D. C.) [trans. title], by G. M. Martelli (pp. 11–36); Two Gall Midges [*Silvestrina asphodeli* n. sp. and *Lestodiplosis asphodeli* n. sp.] on *Asphodelus* in Sardinia, by H. F. Barnes (pp. 70–74); Observations of the Ecology and Biology of *Dociostaurus maroccanus* Thunb. and *Calliptamus italicus* L. and Their Parasites in the Province of Napoli (Naples)—First Contribution [trans. title], by G. Jannone (pp. 75–151); Notes on the Anatomy of Tenthredinid Larvae, with Special Reference to the Head, by H. L. Parker (pp. 159–191); A Biological Account of *Platycleis grisea* F. (Orthoptera-Phasgonuridae) [trans. title], by R. Sarra (pp. 197–209); Description of a New Genus and Species of Callipterine Aphids [*Crypturaphis grassii*] Living on *Alnus cordata* Desf. in Italy [trans. title], by F. Silvestri (pp. 290–294); and A Second Series of Experiments with Attrahents for the Mediterranean Fruit Fly (*Ceratitis capitata* Wied.) [trans. title], by G. Bua (pp. 295–308).

Principles of insect morphology, R. E. SNODGRASS (*New York and London: McGraw-Hill Book Co., 1935, pp. IX+667, figs. 319*).—Following a preface and an introduction, the several chapters of this work on insect morphology deal with the general organization and development; the body wall and its derivatives; body regions, sclerites, and segmentation; the segmental appendages of arthropods; the head; the head appendages; the thorax; the thoracic legs; the wings; the abdomen; the organs of ingestion; the alimentary canal; the organs of distribution, conservation, and elimination; the respiratory system; the nervous system; the sense organs; the internal organs of reproduction; and the organs of copulation and oviposition. A glossary of terms accompanies many of the chapters, and a 22-page list of references to the literature is included.

The evaporation of water from insects, K. Mellanby (*Biol. Rev. Cambridge Phil. Soc., 10 (1935), No. 3, pp. 317–333, figs. 4*).—This contribution deals with the manner in which climatic conditions and insect metabolism affect the rate at which water is evaporated from insects' bodies. It appears that practically all the water evaporated from insects is lost from the tracheal system. At high temperatures the body wall of the cockroach becomes permeable to water.

The bacteria beds of sewage works as an environment for insects, L. Lloyd (*Roy. Ent. Soc. London, Proc., 10 (1935), No. 1, pp. 34–39, figs. 4*).—A report of observations made near Leeds, England.

Airplane collection of insects, etc. [trans. title], L. Berland (*Ann. Soc. Ent. France, 104 (1935), No. 1, pp. 73–96, pl. 1, figs. 7*).—A first report upon the apparatus and method employed, details of flight, and the insects, etc., captured. The insects are tabulated systematically with the date and altitudes (up to 2,300 m) at which they were taken.

Saving garden crops from insect injury, L. H. Shropshire and C. C. Compton (*Illinois Sta. Circ. 437 (1935), pp. [55], figs. 27*).—A practical summary of information on the insect enemies of the more important garden crops and means for their control.

Two common insect pests confront tomato canners, J. J. Davis (*Canning Age, 16 (1935), No. 9, pp. 351, 352, fig. 1*).—The importance of the tomato fruit worm and the pomace fly as tomato pests is considered in this contribution from the Indiana Experiment Station.

Insect pests of mint, G. E. Gould (*Indiana Sta. Circ. 211 (1935), pp. 8*).—This contribution on the insect enemies of mint deals largely (pp. 2–5) with the mint flea beetle *Longitarsus waterhousei* Kutsch., the only major pest of mint (E. S. R., 61, p. 358). First discovered in 1926 to be rather widespread in the muck areas of St. Joseph County, it has spread through the principal mint sections of the State and is a serious menace to profitable mint production.

In control work with insecticides the best results have been obtained through the use on the growing mint of calcium arsenate, which when diluted with 5 to 10 percent bentonite or dusting clay as a sticker is applied at the rate of 15 lb. to the acre, while a 50 percent dust is applied at about 25 lb. to the acre. After the mint is harvested, a paris green-flour mixture at a 1 to 9 dilution is safe to use, and gives a better kill, but it cannot be used on the growing mint. Barium fluosilicate gave a higher percentage of control in cage tests, but caused some injury to plants in the field. Both the calcium arsenate and paris green mixtures should be applied at night or early in the morning when dew is present and very little breeze blowing. When the standing mint is dusted with calcium arsenate, it should not be used as hay for animals after the oil is distilled from it. In those seasons when the insecticide applications will interfere with the normal harvesting of the crop, it is advisable to cut the mint a week or so early. Then the paris green mixture can be applied to the mint stubble at the proper time to obtain the most efficient results.

Special care should be taken to prevent infestation of first-year mint. When ready to cut a field of meadow mint adjoining row mint, a 20-ft. border strip should be thoroughly poisoned and left uncut to kill the beetles as they migrate from the stubble. In that portion of the farm where plants for transplanting in the new field are to be obtained, special care should be taken to kill all beetles. At least three applications should be made to such areas.

Observations of the life cycle of the pest have shown that by the last 10 days of July the majority of the beetles are feeding on the foliage and yet few eggs have been laid. Consequently, the treatment attempting to kill the beetles should be applied during or shortly after this period, or from about July 20 to August 5.

Other pests briefly considered are cutworms, grasshoppers, wireworms, white grubs, millepedes, crane fly maggots (*Tipula mingwe* Alex.), plant lice (*Phorodon menthae* (Buckt.)), thrips, the mint looper *Autographa ou* Gn., etc.

A laboratory guide for use in forestry entomology, V. R. Haber (*Ann Arbor, Mich.: Edwards Bros., 1935, pp. [1]+120*).—This mimeographed work gives digests of information on the more important forest insects for use in laboratory work by students of forestry. Bibliographical references accompany the account of each form.

[Work in forest entomology in 1933], A. F. Fischer (*Philippine Bur. Forestry, Ann. Rpt. Dir. Forestry, 1933, pp. 35–38*).—Work with economic insects during the year is briefly referred to.

Control of forest insect pests: Distribution of parasites in New Zealand, D. Miller and A. F. Clark (*New Zeal. Jour. Sci. and Technol., 16 (1935), No. 5, pp. 301–307*).—This contribution reviews some of the major activities carried on in an attempt to control by biological methods some of the more important pests of introduced trees, placing on record the results of the work insofar as it has progressed. The host insects considered are *Hylastes ater* Payk., *Pineus* (*Chermes*) *pini* Börn., and *Eriococcus coriaceus* Mask.

Notes on insect attack on mora (Mora excelsa Benth.) in Trinidad, C. S. Swabey (*Trinidad and Tobago Forest Dept. Leaflet 6 (1935), pp. 39, figs. 11*).—These notes relate particularly to the bark borers and other coleopterous wood-attacking enemies of *M. excelsa* and means for their control in Trinidad.

Fur and textile pests and their control [trans. title], **H. Kemper** (*Kleintier u. Pelztier, 11 (1935), No. 4–5, pp. 123–187, figs. 31*).—The insect enemies of furs and textiles are dealt with and illustrated in connection with a 6-page list of references to the literature.

A study of the natural control of ragwort (Senecio jacobaea L.), E. Cameron (*Jour. Ecology, 23 (1935), No. 2, pp. 265–322, pls. 2, figs. 11*).—The zoological factors in the control of the ragwort pest considered (pp. 283–310) include over 60 insect forms from 5 different orders, the 2 most important of which, the lepidopteran *Tyria jacobaeae* L. and the dipteran *Pegohylemyia seneciella* Meade, are dealt with at some length. The biology of the other ragwort insects and a survey of insect damage, with notes on plant reaction to attack, are also taken up. The method of mass collections and shipments of weed-controlling insects is also described.

Man, insects, sheep, and rabbits are the chief zoological factors influencing ragwort in New Zealand. The three former are controlling agents, while the action of rabbits in breaking the vegetation cover and exposing the soil is, in general, distinctly favorable to the increase of the plant.

A list of 58 references to the literature is included.

The boxelder bug, A. G. Ruggles (*Minn. Hort., 61 (1933), No. 9, pp. 173, 174, fig. 1*).—The life history and control measures for this insect are discussed in this contribution from the Minnesota Experiment Station.

The effect of temperature and humidity upon the eggs of the bug Rhodnius prolixus (Heteroptera, Reduviidae), N. Clark (*Jour. Anim. Ecol., 4 (1935), No. 1, pp. 82–87, figs. 2*).—Experiments were conducted to determine the effect of temperature and humidity on the (1) duration of the egg stage and (2) percentage of hatch in the eggs of *R. prolixus*, eggs laid within the preceding 24 hr. having been used.

It was found that "temperature controls the duration of the egg stage, except that at complete saturation there is a small retardation in development at all temperatures. Above 34° C. no embryos hatch, though they may complete development at 36°. One hundred percent hatch is obtained over a wide range of temperature and humidity conditions. The percentage hatch is decreased at all temperatures by (1) decreasing relative humidity below a certain minimum which rises with temperature [and] (2) complete saturation of the atmosphere."

A mealy bug, Phenacoccus aceris Signoret, a new apple pest in Nova Scotia, F. C. Gilliatt (*Canad. Ent., 67 (1935), No. 8, pp. 161–164*).—The species of mealybug *P. aceris* first came into prominence in 1932 in a few orchards in the Annapolis Valley of Nova Scotia, more particularly at Lakeville and the district north of Berwick, and became a source of damage due to the growth of a sooty fungus on the surface of the fruit. In severe infestations such as occurred in a few orchards in 1932 and 1934 the entire fruit was blackened, affecting the skin to such an extent that it became roughened, and the sooty coating being impossible of successful removal with any known agent. Though common in Europe, where it has been described under many names, this appears to be a new record as an apple pest in Canada. Notes are given on its morphology and biology.

A general summary of experiments with sugarcane.—III, Recommendations for control of the sugarcane borer in Louisiana, W. E. Hinds and B. A. Osterberger (*Louisiana Sta. Bul. 267 (1935), pp. 12–16*).—In this contribution recommendations for sugarcane borer control, based upon the results of observations and experiments previously noted (E. S. R., 72, pp. 80, 84), are briefly presented. They include (1) cutting out "dead hearts" caused by the first generation borers when they appear abundantly in cane; (2) the destruction of heavily infested early corn in gardens or fields before the first generation moths can emerge therefrom; (3) the colonization of egg parasites (*Trichogramma minutum* Riley) upon the borer eggs as they are being laid for the second generation; (4) the dusting of cane (not corn) with high-grade light sodium fluosilicate early in July where parasite colonization was not attempted or where this was done too late to check the hatching of second-generation eggs; (5) the planting of borer-free seed cane whenever possible to secure it; (6) the cutting of cane in harvesting at or below the ground level; (7) the practice of general clean up in all cane plantation areas to destroy scattered stalks around hoists, along railway lines and roadways and at factory yards; and (8) the burning of cane top trash as thoroughly as possible so as to destroy all borer larvae passing the winter therein.

Diatraea albicrinella Box, a species new to the Trinidad fauna, H. E. Box (*Trop Agr.* [*Trinidad*], *12 (1935), No. 8, pp. 221, 222*).—The occurrence of this borer, found in the succulent stalks of giant grass (*Panicum grande*), and the seventh species of *Diatraea* known to occur in Trinidad, is reported upon.

The control of the coconut spike moth Tirathaba trichogramma Meyr. in Fiji, R. W. Paine (*Fiji Dept. Agr. Bul. 18 (1935), pp. 30*).—A report on a campaign against *T. trichogramma*, commenced in 1929.

Notes on the galleriid moth Corcyra cephalonica Stainton, J. M. Nicol (*Ent. Mo. Mag., 3. ser., 21 (1935), No. 247, pp. 153–156, fig. 1*).—A description is given of the various stages of *C. cephalonica*, referred to by Chittenden as the "rice moth" (E. S. R., 41, p. 459), which has been recently found in some samples of Venezuelan cacao sent to England in closed tins. In one tin the damaged beans amounted to 12 percent of the total. Although a single larva of the tobacco moth was found present, the damage was due to *C. cephalonica.*

The parasites of some lepidopterous stalk borers in Iowa, G. C. DECKER (*Iowa State. Col. Jour. Sci., 9 (1935), No. 4, pp. 567–580*).—Information on the parasites of stalk borers in Iowa, gained during the course of a study of these pests by the Iowa Experiment Station, is presented with a list of 29 references to the literature. Nine species of Diptera and 19 species of Hymenoptera reared from 10 noctuid and 2 olethreutid species, namely, *Achatodes zeae* (Harr.), *Luperina stipata* (Morr.), the iris borer, the stalk borer, *Papaipema cataphracta* (Gr.), *P. arctivorens* Hamps., the columbine borer, *P. frigida* Smith, *Oligia fractilinea* (Gr.), *Archanara subcarnea* (Kell.), *Epiblema otiosana* (Clem.), and *E. strenuana* (Walk.), are considered.

Injury to bacon by the European grain moth [trans. title], A. RONNA (*Rev. Dept. Nac. Prod. Anim.* [*Brazil*], *1 (1934), No. 1, pp. 29–39, pl. 1; Eng. abs., p. 39*).—Injury to bacon stocks of the Italian type from various districts of the State of Rio Grande do Sul by the European grain moth is reported upon by the author.

Xylomyges curialis Grote and other citrus cutworms, H. H. KEIFER (*Calif. Dept. Agr. Bul., 24 (1935), No. 4–6, p. 234*).—Notes are presented on several noctuids which damage citrus trees and fruit to a considerable extent in Tulare County, Calif.

California microlepidoptera, VII, H. H. KEIFER (*Calif. Dept. Agr. Bul., 24 (1935), No. 4–6, pp. 195–218, pls. 5*).—This further contribution (E. S. R., 71, p. 67) presents notes on economic microlepidoptera, with descriptions of eight new species.

Studies of fluctuations in insect populations.—IV, The Arabis midge Dasyneura arabis (Cecidomyidae), H. F. BARNES (*Jour. Anim. Ecol., 4 (1935), No. 1, pp. 119–126, pl. 1, fig. 1*).—This is a fourth contribution (E. S. R., 72, p. 814).

New Jersey Mosquito Extermination Association, twenty-second annual meeting (*N. J. Mosquito Extermin. Assoc. Proc., 22 (1935), pp. 186+[3], figs. 4*).—The contributions presented at the twenty-second annual meeting of the association, held at Atlantic City in March 1935 (E. S. R., 72, p. 228), include the following: New Jersey and Mosquitoes in 1934, by T. D. Mulhern (pp. 7–37), contributed from the New Jersey Experiment Stations; A Summary of Mosquito Works Accomplished in New Jersey through the Use of Emergency Relief Labor, by L. W. Smith (pp. 37–42); Mosquito Extermination as an Outlet for Emergency Relief Labor, by L. Compton (pp. 42–48); Mosquito Work throughout the World in 1934, by F. C. Bishopp and C. N. Smith (pp. 50–77); Mosquito Suppression Work in Canada in 1934, by A. Gibson (pp. 77–91); Accomplishments in Mosquito Control in Utah, by R. V. Chamberlin and D. M. Rees (pp. 93–98); Drainage Works Accomplished in Delaware by the CCC and CWA, by W. S. Corkran (pp. 98–114); Effect of Drainage Work Accomplished by the CCC upon the Prevalence of Mosquitoes at Lewes, Delaware, during 1934, by D. MacCreary and L. A. Stearns (pp. 115–121), contributed from the Delaware Experiment Station; Mosquito Control Work in Connecticut in 1934, by R. C. Botsford (pp. 122–125), contributed from the Connecticut [New Haven] Experiment Station; Mosquito Work in New York City, by J. L. Rice (pp. 126–130); Relation of Mosquito Control in New Jersey to Bird Life of the Salt Marshes, by C. A. Urner (pp. 130–136); The Relation of Mosquito Control to the Muskrat Industry on the Salt Marshes, by W. S. Corkran (pp. 137–141); The Relation of Mosquito Control in New Jersey to the Presence of Game on the Salt Marshes, by H. J. Burlington (pp. 141, 142); The Relation of Mosquito Control in New Jersey to Oyster Production on the Salt Marshes, by

T. C. Nelson (pp. 142–144); Summary of Symposium on the Relation of Mosquito Control in New Jersey to Wild Life on the Salt Marshes, by T. J. Headlee (pp. 144–146); Larvicides and a Method for Temporary Protection from Adult Mosquitoes in Limited Areas, by J. M. Ginsburg (pp. 147–151), and The New Jersey Mosquito Problem—a Survey of Past Performance, Present State, and Future Outlook, by T. J. Headlee (pp. 151–161), both contributed from the New Jersey Experiment Stations; The Effect of Reduced Appropriations on Anti-mosquito Work in New Jersey, by F. A. Reiley (pp. 161–164); and The Practical Importance of How to Get and How to Use an Accurate Picture of Daily Mosquito Conditions on a County-wide Basis, by R. J. VanDerwerker (pp. 164–170).

The effect of high temperatures on the length of life of certain species of mosquitoes, H. A. Johnson (*Jour. Tenn. Acad. Sci., 10 (1935), No. 3, pp. 225–227, fig. 1*).—A graph is presented which shows the effect of high temperature upon the length of life of three species of mosquitoes studied. The yellow-fever mosquito withstood a temperature of 113° for 30 min. and 117° for 10 min. With the malaria mosquito *Anopheles quadrimaculatus* a temperature of 103° caused a considerable shortening of its life cycle, while at a temperature of 108.5° it survived an average of only 20 min. The resistance of *Culex quinquefasciatus* followed very closely that of *A. quadrimaculatus*.

On the nutritional requirements of mosquito larvae (Aedes aegypti), W. Trager (*Amer. Jour. Hyg., 22 (1935), No. 2, pp. 475–493*).—The larvae of the yellow-fever mosquito require two accessory food substances. "One of these, present in yeast and aqueous yeast extracts, egg white, and wheat, is heat- and alkali-stable and is not absorbed by fuller's earth. The other, present in large amount only in partly purified liver extracts rich in the antipernicious anemia principle, is heat stable but is destroyed by alkali, and in slightly acid solution is almost completely absorbed by fuller's earth."

Aquatic Diptera.—Part II, Orthorrhapha-Brachycera and Cyclorrhapha, O. A. Johannsen (*[New York] Cornell Sta. Mem. 177 (1935), pp. 62, pls. 12*).—In the introduction to this second part (E. S. R., 72, p. 510) the taxonomic characters, methods of preserving and studying immature stages of Diptera, and the economic importance of the insects are considered. Keys to the larvae and to the pupae of North American aquatic Diptera are next presented, followed by descriptions of 16 families of the Orthorrhapha-Brachycera and Cyclorrhapha. A list of 88 references to the literature and an index to the genera are included.

Preliminary contribution on the parasites of grasshoppers at Richelieu (Indre-et-Loire) [trans. title], J. Callot (*Ann. Parasitol. Humaine et Compar., 13 (1935), No. 3, pp. 193–202*).—In a study of 3,950 grasshoppers, 93 were found parasitized by dipterous larvae, 37 by Conopidae and 59 by Sarcophagidae.

New North American Tachinidae, H. J. Reinhard (*Bul. Brooklyn Ent. Soc., 29 (1934), No. 5, pp. 186–195*).—Seven species of Diptera, representing four tachinid genera, namely, *Anetia, Dexodes, Erycia*, and *Phorocera*, are described as new.

Two new species of the tachinid genus Siphosturmiopsis with key and notes (Diptera), H. J. Reinhard (*Ent. News, 45 (1934), No. 1, pp. 15–19*).—*S. oteroensis* from Otero County, N. Mex., and *S. rufiventris* from Monrovia Canyon, Calif., are described as new.

North American parasitic flies of the genus Spathidexia, with descriptions of two new species, H. J. Reinhard (*Bul. Brooklyn Ent. Soc., 29 (1934), No. 4, pp. 150–154*).—Four species of the tachinid genus *Spathidexia* are recognized, of which two are described for the first time, namely, *S. cerussata* from Amherst, Ohio, and *S. rasilis* from Madison, Wis., and Amherst, Ohio.

Glycero-boric blowfly dressing (*Jour. Dept. Agr. Victoria, 33 (1935), No. 7, p. 349*).—A relatively simple dressing which has given fairly good results in Australia consists of 1 gal. of glycerin (13 lb.) and 3 lb. of powdered boric acid, heated and stirred until the boric acid is dissolved, resulting in the formation of various borates of glycerin. While the maggots are killed rather slowly, 24 to 30 hr. often elapsing before all are dead, they cease to worry the sheep immediately the dressing is applied.

Species of Calliphoridae concerned in the production of myiasis in domestic animals, Menard County, Texas, H. E. Parish and E. W. Laake (*Jour. Parasitol., 21 (1935), No. 4, pp. 264–266*).—In studies conducted during 1931, 1932, and 1933 at Menard, Tex., three species of Calliphoridae were reared from wounds of domestic animals infested in nature. "*Cochliomyia* spp., the screwworm flies, composed over 99 percent of the total of all adults reared from larvae found in wounds of domestic animals during the summer and fall months. *Phormia regina* Meig., the black blowfly, constituted over 67 percent of all adults reared from larvae developed in wounds of domestic animals during the spring months in 1933. *Sarcophaga plinthopyga* Wied., a flesh fly, was found in very limited numbers in wounds of domestic animals."

Studies on the influence of the environment on the sheep blow-fly Lucilia sericata Meig., II, III, A. C. Evans (*Parasitology, 27 (1935), No. 2, pp. 291–298, figs. 6; 299–307, figs. 4*).—Part 2 of this contribution (E. S. R., 72, p. 229) deals with the influence of humidity and temperature on prepupae and pupae, and part 3 with the influence of humidity and temperature on the adult.

Rat-flea survey of the port of Philadelphia, Pa., C. W. Vogel and C. Cadwallader (*Pub. Health Rpts. [U. S.], 50 (1935), No. 30, pp. 952–957, fig. 1*).—A rat-flea survey conducted in the port of Philadelphia from May 3, 1932, to December 22, 1933, resulted in the capture of 2,765 rats, from which 4,629 fleas were taken. Of this number of fleas, 2,799 were the oriental rat flea; 1,472 were the rat flea; 110 were the cat flea or dog flea; 54 were *Leptopsylla musculi;* and 110 were the sticktight flea.

Excluding the July 1932 data from the above figures because of the undue weight they would give, due to unusual conditions obtaining, the total flea index for the entire period is 1.55 and the oriental rat flea index is 0.90. *Rattus norvegicus* was practically the only species of rat encountered. The oriental rat flea index was found to follow fairly closely the seasonal curve of relative humidity and temperature.

Biology and ecology of Cassida viridis L. [trans. title], **H. Engel** (*Ztschr. Morph. u. Ökol. Tiere, 30 (1935), No. 1, pp. 41–96, figs. 40*).—This is a report of extended studies of the morphology, biology, and ecology of a leaf beetle of which *Mentha aquatica*, *Stachys silvaticus*, and *Lycopus europaeus* are the principal food plants. A list is given of 36 references to the literature.

An account of *C. nobilis* by Kaufmann has been noted (E. S. R., 71, p. 76).

The pinhole borer of north Queensland cabinet woods, J. H. Smith (*Queensland Agr. Jour., 43 (1935), Nos. 5, pp. 445–451, figs. 14; 6, pp. 532–548, figs. 16; 44 (1935), Nos. 1, pp. 9–14, pls. 4; 2, pp. 145–153*).—*Crossotarsus grevilleae* Lea, the most important platypodid beetle to the manufacturer of veneer from north Queensland rain forest cabinet woods, since it may penetrate the whole of the log if milling is delayed, is dealt with.

Trapping experiments for the control of the cigarette beetle, W. D. Reed, A. W. Morrill, Jr., and E. M. Livingstone (*U. S. Dept. Agr. Circ. 356 (1935), pp. 14, figs. 9*).—This is a report of work with a beetle trap, a description of which, together with data on experiments in 1932, has been noted (E. S. R., 72, p. 81).

"Three trapping experiments were conducted in 1933. Experiment 1 included 1,105,000 cu. ft. of open-storage warehouses containing Turkish tobacco and 4,199,000 cu. ft. of the same type of warehouses containing domestic flue-cured tobacco. One suction light trap was operated for each 110,500 cu. ft. of storage space. Experiment 2 included 1,897,000 cu. ft. of open-storage Turkish tobacco warehouses and 1,517,000 cu. ft. of open-storage warehouse filled with domestic flue-cured tobacco. A suction light trap was operated for each 75,850 cu. ft. of warehouse space. In both experiments it was demonstrated that Turkish tobacco was more heavily infested by the cigarette beetle than domestic tobacco, and that the migration of this insect is influenced both by temperature and the season of the year.

"Experiment 3 included 3,125,000 cu. ft. of Turkish tobacco storage of the closed type. Trap records show a greater population of the cigarette beetle in closed than in open storages. The largest average catch of beetles, 954,619 per trap, was made during the 4-day period September 9 to 13, when one trap was used for each 48,828 cu. ft. of storage space.

"During 1932 and 1933 samples of trapped cigarette beetles were dissected in order to determine sex ratios. In 1932, of the 5,878 beetles dissected, 36.6 percent were males and 63.4 percent were females. In 1933, of the 1,140 beetles examined, 43.6 percent were males and 56.4 percent were females.

"The suction light trap is not effective against the tobacco moth (*Ephestia elutella* Hbn.).

"The suction light trap is a promising device for use in controlling the cigarette beetle in open-storage warehouses. The large catches of insects obtained in the experiments indicate that the population of these insects in tobacco warehouses can be materially reduced with these traps."

Field observations on the alfalfa weevil in middle California, A. E. MICHELBACHER and E. O. ESSIG (*Calif. Dept. Agr. Bul., 24 (1935), No. 4–6, pp. 221–231, figs. 5*).—Observations conducted up to the present time indicate clearly that the alfalfa weevil will not become a major pest over most of the alfalfa-growing region of California. "In places where it might cause damage of a serious nature this damage probably always will be confined to the first cutting, and can be reduced or even eliminated if the alfalfa is kept in a vigorous condition and cut as soon as mature. Of all the factors which influence the weevil and limit its destructiveness, climate appears to be the most important. So far the spread of the weevil has been slow, and despite the fact that up to the present time it does not appear that it will be a serious pest in certain areas, practical measures against its dissemination should be continued. This is particularly true of the cooler coastal regions, for it is in this area, according to our investigation to date, that the weevil is most likely to be troublesome."

The alfalfa snout beetle Brachyrhinus ligustici L., C. E. PALM ([*New York*] *Cornell Sta. Bul. 629 (1935), pp. 47, figs. 36*).—This is a detailed report of studies of the morphology, biology, economic importance, natural enemies, and control of *B. ligustici*, a summary of which has been noted (E. S. R., 73, p. 362). A list of 22 references to the literature is included.

The A B C and X Y Z of bee culture, A. I. and E. R. ROOT (*Medina, Ohio: A. I. Root Co., 1935,* [*rev. and enl. ed.*], *pp.* [*15*]*+815, figs. 728*).—This edition (E. S. R., 60, p. 655) is said to be an almost new book from cover to cover. All of the titles have received some changes, many of them having been largely revised and others entirely rewritten. A large number of new titles have been added, particularly under the head of honey.

A species of ant becomes destructive to bees when apiary is placed in their territory, F. H. WYMORE (*Calif. Dept. Agr. Bul., 24 (1935), No. 4–6,* *p. 220*).—This note relates to an attack of the mound-building ant *Formica rufa obscuripes* Forel upon an apiary in Eldorado County, Calif.

Populations, territory, and interrelations of the ants Formica fusca, Acanthomyops niger, and Myrmica scabrinodis at Garforth (Yorkshire), W. Pickles (*Jour. Anim. Ecol., 4* (*1935*), *No. 1, pp. 22–31, pl. 1, figs. 2*).—It has been found that of the three species of ants studied by the author *F. fusca* has the largest feeding territory (286 sq. yd.), with *M. scabrinodis* next (140 sq. yd.), and *A. niger* the least (35 sq. yd.). The three species apparently live on good terms with each other and have common foraging territory. The most populous nests are those of *A. niger* and the least populous *M. scabrinodis*. All the species appeared to live on the excreta of aphids cultivated on the rosebay (*Epilobium angustifolium*), together with adhering flesh of dismembered insects. *F. fusca* was the only species found experimentally to take fruit, and this species may obtain part of its food from the wild strawberry so common on the area.

Wasps not affected by [American foul brood], C. A. Reese (*Gleanings Bee Cult., 63* (*1935*), *No. 6, p. 357, fig. 1*).—The author found that the larvae and pupae of the white-faced hornet in a nest attached to the infected comb within a hive whose bee occupants had succumbed to the American foul brood were not affected. He reports that it is not unusual to find bumblebees taking advantage of the protection of an abandoned beehive for the construction of their nest and to thrive in the presence of this organism.

Hymenopterous predators in the region of Fréjus, Department of Var [trans. title], F. Bernard (*Ann. Soc. Ent. France, 104* (*1935*), *No. 1, pp. 31–72, figs. 4*).—This contribution is presented with a list of 32 references to the literature.

A new name for Mutilla dimidiata Lepeletier, with a redescription of the type specimen, C. E. Mickel (*Ann. Ent. Soc. Amer., 26* (*1933*), *No. 2, pp. 377–380*).—This contribution from the Minnesota Experiment Station proposes the new name *Timulla orientalis* for the mutillid wasp *M. dimidiata* 1845, discusses its systematic relationships, and redescribes the original specimen upon which Lepeletier based his species.

The Mutillidae of Formosa, C. E. Mickel (*Ann. Ent. Soc. Amer., 26* (*1933*), *No. 2, pp. 381–423*).—In this contribution from the Minnesota Experiment Station on the mutillid wasps of Taiwan (Formosa), 38 species and subspecies, representing 4 genera, are recognized, 15 of which are described as new to science. Keys for the identification of the genera and species are included and the systematic relationships of the genera *Squamulotilla*, *Timulla* (*Trogaspidia*), and *Smicromyrme* discussed. A bibliography of the literature on Formosan mutillids is given.

Parasites reared from Argyrotaenia (Tortrix) citrana Fernald, A. J. Basinger (*Calif. Dept. Agr. Bul., 24* (*1935*), *No. 4–6, pp. 233, 234*).—A study of parasitism of the orange tortrix, which periodically is a serious pest of oranges and grapefruit in certain parts of southern California, indicates that it is a contributing factor to such periodicity, since parasitism frequently reaches from 75 to 90 percent of the host larvae. A list of the parasites thus far recorded from the California Citrus Experiment Station includes the following: *Apanteles aristoteliae* Vier., *Hormius basalis* (Prov.), *Campoplex* n. sp. near *phthorimaeae*, *Exochus* sp., *Nepiera* n. sp., *Dioctes eureka* (Ashm.), *Microbracon gelechiae* (Ashm.), *Goniozus longinervis* Fouts, *Brachymeria* sp., *Trichogramma minutum* (Ashm.), *Zenillia caesar* Ald., and *Lispidia* sp. near *palpigera* Coq. Five secondary parasites are also recorded, namely, *Mesochorus* sp., *Brachymeria* sp., *Catolaccus aeneoviridis* (Gir.). *Habrocytus* sp., and *Dibrachys boucheanus* (Ratz.).

Notes on the parasites of the peach twig borer in southern California (Anarsia lineatella Zell.), A. J. Basinger (*Calif. Dept. Agr. Bul., 24 (1935), No. 4–6, pp. 245, 246*).—This contribution from the California Citrus Experiment Station reports upon the introduction and liberation of *Copidosoma pyralidis* (Ashm.), an important enemy of the peach twig borer, in the Chino peach district of San Bernardino County in the summer of 1931. In June and July 1932 a 32 percent parasitism by *C. pyralidis* was found in the corner of the orchard in which the parasite had been liberated. Only 1.67 percent of the 2,275 individuals of the peach twig borer represented were parasitized by native species, which included the encyrtid *C. pyralidis*, the eulophid *Secodella* sp., the elasmid *Elamus setosiscutellatus* (Cwfd.), the braconids *Microbracon mellitor* (Say) and *M. gelechiae* (Ashm.), the tachinid *Anachaetopsis tortricis* Coq., and the straw itch mite.

A revision of the African Telenominae (Proctotrupoidea, fam. Scelionidae), G. E. J. Nixon (*Roy. Ent. Soc. London, Trans., 83 (1935), No. 1, pp. 73–103, pl. 1, figs. 14*).—This is a review of a group of important egg parasites, chiefly of Lepidoptera and Hemiptera. Keys to the genera and species are included. Twenty-seven species are described as new to science, and the genus *Nirupama* is erected.

Apanteles solitarius (Ratzeburg), an introduced braconid parasite of the satin moth, D. L. Parker (*U. S. Dept. Agr., Tech. Bul. 477 (1935), pp. 18, figs. 8*).—A report of studies of the biology of *A. solitarius*, a solitary, internal parasite of the satin moth, generally distributed throughout central Europe wherever this pest occurs. It was first introduced into the United States in the summer of 1927 and liberated from 1927 to 1932 in satin moth infested localities, including 5 towns in Massachusetts and 1 town in New Hampshire, with 1 lot of adults being shipped to Kent, Wash. More recently the species has been introduced from New England into Canada. A map is given showing its present known distribution.

The species has been found to overwinter in two forms, as a prepupal larva within a cocoon and as a first-instar larva within the hibernating host. The adults from the overwintering cocoons emerge before those larvae that overwintered in the first instar form cocoons. These adults attack the host larvae coming from their hibernacula and produce cocoons late in May and early in June. The adults from these cocoons attack small larvae of the host, and from this attack some parasite larvae overwinter in the first instar, some cocoons are formed, and a small number of adults may issue. The adults from the overwintering larvae appear about the middle of May. They attack the feeding larvae of the host and produce a generation which in time attacks the very small larvae. The history from this point on corresponds with that for the group produced by adults from overwintering cocoons.

"Collections from several towns indicate rapid spread of the parasite and that it is now apparently distributed over the territory in New England infested with the satin moth. From a study of the hibernating form of the host, it is shown that *A. solitarius* effected a parasitization of 14.5 to 66.7 percent, and in 12 of the 15 towns in which observations were made the percentage of parasitization was greater than 40 percent.

"The factors that are operating to reduce the effectiveness of *A. solitarius* are the other parasites which attack the host and those parasites which normally attack cocoons of the genus *Apanteles*. There do not appear to be any climatic factors that would limit the effectiveness of this parasite where the host itself could survive."

A redescription of Taenia tenuicollis Rudolphi 1819 and its larva Cysticercus talpae Rudolphi 1819, M. S. Skinker (*Parasitology, 27 (1935),* *No. 2, pp. 175–185, figs. 2*).—In this first report of *T. tenuicollis* and its larva *C. talpae* in North America, the author gives a description based entirely upon specimens from the mink *Mustela vison* collected on an experimental fur farm near Kirkfield, Ont.

Red-mite control by oil-sprays, W. Cottier (*New Zeal. Jour. Sci. and Technol., 16* (*1935*), *No. 5, pp. 261–270, figs. 8*).—In experiments in the winter of 1933 on the effect of petroleum oil sprays on the winter eggs of both species of red mites commonly found on fruit trees, namely, the European red mite and the clover mite, those of the former were found to be more difficult to kill than those of the latter. It appears that emulsification has a great influence on the killing properties of an oil, unstable emulsions being more effective in killing winter eggs of these mites, especially the European red mite, than are stable emulsions. It is pointed out that an increase in the viscosity of an oil in a stable emulsion may not necessarily result in a satisfactory kill of the European red mite.

The European red mite (Paratetranychus pilosus C. & F.) in Nova Scotia, F. C. Gilliatt (*Canad. Jour. Res., 13* (*1935*), *No. 1, Sect. D, pp. 1–17, figs. 4*).—The terminology, food plants, dispersion, and economic importance of the European red mite, which affects deciduous fruit trees in America, are discussed. This mite, first observed in Nova Scotia in 1913, became of economic importance in 1925. The life history, obtained from an insectary and field study extending from 1930 to 1932, is recorded in detail. There are two complete generations and three partial generations in Nova Scotia. Fluctuations in temperature markedly affect mite development. Natural control of the winter eggs is important.

Some predators of the European red mite (Paratetranychus pilosus C. & F.) in Nova Scotia, F. C. Gilliatt (*Canad. Jour. Res., 13* (*1935*), *No. 2, Sect. D, pp. 19–38, pl. 1*).—Predators were found to be the most important natural enemies of the European red mite in Nova Scotia. Notes are given on the life history and habits of the following predacious enemies of this mite: *Seiulus pomi* Parr., *Diaphnidia pellucida* Uhl., *D. capitata* Van D., *Hyaliodes vitripennis* Say, *Stethorus punctum* Lec., *Plagiognathus obscurus* Uhl., *Camptobrochis nebulosus* Uhl., *Anystis agilis* Banks, *Campylomma verbasci* Mey., and an unidentified species of Syrphidae.

Tropical rat mite attacking man in St. Louis area, A. McIntosh (*Helminthol. Soc. Wash. Proc., 2* (*1935*), *No. 1, pp. 62, 63*).—The tropical rat mite, shown experimentally by Dove and Shelmire to transmit endemic typhus (E. S. R., 67, p. 282), is recorded from the St. Louis area.

A note on the identity of Nematodirus tarandi Hadwen 1922 and Nematodirus skrjabini Mitzkewitsch 1929 (Nematoda: Trichostrongylidae), G. Dikmans (*Helminthol. Soc. Wash. Proc., 2* (*1935*), *No. 1, p. 56*).—The author finds that *N. skrjabini* from the reindeer is identical with and the name a synonym of *N. tarandi*.

Observations on the life history of Toxascaris leonina (Nematoda: Ascaridae), W. H. Wright (*Helminthol. Soc. Wash. Proc., 2* (*1935*), *No. 1, p. 56*).—Feeding experiments carried out by the author with albino rats, mice, guinea pigs, and dogs indicate that the larvae of *T. leonina* do not regularly migrate through the body of the host. "Occasionally, particularly in very heavy infestations, some larvae will penetrate the wall of the small intestine and develop in the abdominal cavity, or reach such organs as the mesenteric lymph nodes, pancreas, liver, and lungs. Larvae in these locations are capable of developing into third-stage larvae, as larvae recovered from these organs have been in the same stage of development as those recovered from the lumen of the small intestine in the same length of time after infection. Larvae which reach the lungs are capable of finding their way into the trachea, where they are carried upward, are swallowed, and again reach the small intestine, and such larvae probably develop to maturity."

ANIMAL PRODUCTION

Methods of experimentation in animal nutrition, E. J. Sheehy (*Jour. Agr. Sci.* [*England*], *24* (*1934*), *No. 2, pp. 312–314, fig. 1*).—In this article from University College, Baile Atha Cliath (Dublin), the author undertakes to show that an interpretation made by Dunlop (E. S. R., 72, p. 670) of a method described in a previous article (E. S. R., 67, p. 299) is based upon an incorrect impression.

Reply to note by E. J. Sheehy on methods of experimentation in animal nutrition, G. Dunlop (*Jour. Agr. Sci.* [*England*], *24* (*1934*), *No. 2, pp. 335–339, figs. 4*).—A reply to the above article.

[Livestock studies by the U. S. Department of Agriculture] (*U. S. Dept. Agr. Yearbook 1935, pp. 123–125, 133–136, 165–167, 171–174, 178–181, 230–233, 261, 262, 270–273, 294–297, 324–326, figs. 13*).—Information obtained in studies with livestock is presented under the following headings: Artificial Drying Provides Means of Preserving Feeding Value of Immature Grasses, by R. E. Hodgson (pp. 123–125); Beef Cattle Especially Adapted to Gulf Coast Area Being Developed, by W. H. Black (pp. 133–136); Dairy-Herd Improvement Facilitated by Testing Cows Year after Year, by J. C. McDowell (pp. 165–167); Dried Skim Milk Added to Other Foods Improves Their Nutritive Value, by G. E. Holm (pp. 171–174); Egg Hatchability Is Increased by Frequent Turning in Incubator, by T. C. Byerly (pp. 178, 179); Egg Yield of Chickens Is Affected by Content of Vitamin D in Diet, by H. W. Titus (pp. 179–181); Hams Stored in Tight Cloth Bags Keep Well for Use in Farm Home, by R. L. Hiner (pp. 230, 231); Hogs of Danish Origin Imported for Breeding Studies in This Country, by O. G. Hankins and J. H. Zeller (pp. 231–233); Milk Sugar Produces More Rapid Growth in Young Animals than Cane Sugar, by E. O. Whittier (pp. 261, 262); Pastures That are Well Managed Serve as Means of Drought Insurance, by A. T. Semple (pp. 270–273); Sheep Improvement in United States Should Result from Recent Importations, by C. G. Potts (pp. 294–297); and Vitamin A Value of Plant Feeds Fully Accounted for by Their Carotene Content, by E. B. Meigs (pp. 324–326).

[Livestock investigations in Alabama] (*Alabama Sta. Rpt. 1934, pp. 19, 20, 23, 24*).—Data obtained in investigations on the effect of vitamin B_1 insufficiency upon the nervous tissues of young dogs, by C. O. Prickett, and the supplemental value of peanuts to the laying ration, by D. F. King and G. J. Cottier, are reported.

[Livestock experiments in Delaware] (*Delaware Sta. Bul. 192* (*1935*), *pp. 21–25*).—The results obtained in tests with livestock are reported on protein supplements for pigs, and forage crops for swine, both by A. E. Tomhave; and utilization of ground soybeans for poultry, protein levels of rations in growing chicks, and germinated oats for laying birds, all by Tomhave and C. W. Mumford.

[Livestock experiments in Idaho] (*Idaho Sta. Bul. 217* (*1935*), *pp. 7, 16, 17, 38, 39, 47, 48*).—The results obtained in studies with livestock are reported on seasonal variation in pasture grass; pasture management; the effect of soil phosphorus upon the phosphorus content of alfalfa hay; variation in the milk production of sows; a device for measuring jaw defects in sheep; minerals and protein supplements for fattening steers at the Caldwell Substation; effect of proteins, minerals, and shearing on fattening lambs at the Caldwell

Substation; the vitamin A and D potency of sardine oils for chicks; the influence of the vitamin D factor upon the optimum levels of calcium and phosphorus; and the necessity of adding animal proteins to rations containing peas for laying birds.

Animal husbandry (*Minnesota Sta. Bul. 319 (1935), pp. 30–34, 58, 59, 71, 72, 75, 76, 77*).—Findings obtained by the station since 1892 are briefly noted as to use of annual pasture crops, feed consumption of growing and fattening steers, baby beef production, cattle breeding, fattening lambs, swine feeding and breeding, poultry feeding, housing, and breeding, and turkey production.

[Investigations with livestock in North Carolina] (*North Carolina Sta. Rpt. 1933, pp. 44–52, 60–62*).—Data obtained in nutrition experiments are reported on the vitamin B and G contents of cottonseed meal and peanut meal, by F. W. Sherwood and J. O. Halverson.

In tests with beef cattle results were obtained in vitamin A studies in cottonseed meal, by Halverson, E. H. Hostetler, and J. E. Foster; comparative study of the quality of meat from native and first-cross Hereford yearlings, and value of crop gleanings for wintering cattle, both by Hostetler, Foster, and L. I. Case; comparative gains on pasture of native v. grade Hereford calves and yearlings, by Foster and Hostetler; winter gleanings for beef cattle, by Case, Hostetler, and W. W. Jarvis; and pasture fertilization, by Case, Foster, and E. E. Bell.

Swine studies yielded results on the effect of feeding pigs peanuts followed by corn and cottonseed meal, by Hostetler and Halverson; retarded growth in swine, by Hostetler and Foster; utilization of soybeans as hay and by hogging off, by Hostetler, H. B. Mann, and R. E. Currin, Jr.; cottonseed meal for fattening pigs, by Hostetler and J. L. Rea, Jr.; cottonseed meal for brood sows, a comparison of fish meal with other protein supplements for fattening pigs, and quantity of salt for curing pork, all by Hostetler and R. E. Nance.

Information obtained in sheep studies is reported on upgrading of native eastern North Carolina sheep, and the effect of mature soybeans on nursing ewes, both by Foster and Hostetler.

Poultry experiments yielded information on the relationship of protein levels in developing mashes to physical and sexual maturity of pullets, and cost of production studies, both by R. S. Dearstyne, C. O. Bollinger, and G. K. Jones; influence of fermented mash on the annual production of Rhode Island Red pullets, by Dearstyne and Bollinger; a comparison of returns from pullets hatched for summer production with those bred for autumn and winter production, by Dearstyne; and menhaden fish oil as a source of vitamin D for growing chicks, by Halverson and Dearstyne.

The specific dynamic effects of protein, fat, and carbohydrate as determined with the albino rat at different planes of nutrition, M. Kriss, E. B. Forbes, and R. C. Miller (*Jour. Nutr., 8 (1934), No. 5, pp. 509–534*).—The purpose of this investigation at the Pennsylvania Institute of Animal Nutrition was to explain differences observed in experiments with cattle between the dynamic effects of foods above and below maintenance. Albino rats with an initial weight of about 100 g were used as experimental animals in a series of respiration trials.

The average specific dynamic effect expressed as percentages of the metabolizable energy of the supplements when added to the basal maintenance ration was 31.4 percent for casein, 22.5 for starch, and 16.5 percent for olive oil. These values were markedly greater than the corresponding increases in heat production, over the fasting metabolism, resulting from the exclusive feeding of casein, starch, and olive oil, when these heat increments were related to the metabolizable energy ingested.

All heat increment values determined with respect to fasting, with correction for the sparing of body protein, were found to be considerably higher than the corresponding uncorrected values. The heat increment values of casein, starch, and olive oil corrected for the sparing of both protein and fat were found to agree reasonably well with the heat increment values of these substances determined above maintenance.

The results are deemed to justify the conclusions that (1) the heat produced by the katabolism of body protein includes a factor of waste heat of utilization and (2) heat increment values of rations determined directly with reference to the fasting heat production (uncorrected for the sparing of body tissue) are lower than the true energy expense of utilization by the amounts of the dynamic effect of body substance spared.

The derivation of factors for computing the gaseous exchange and the heat production in the metabolism of casein by the albino rat, M. Kriss and R. C. Miller (*Jour. Nutr., 8 (1934), No. 6, pp. 669–674*).—Experiments with rats were undertaken at the Pennsylvania Institute of Animal Nutrition to determine balances of nitrogen, carbon, and energy when the animals received exclusive casein rations in quantities sufficient to meet the energy requirements approximately.

The results showed that of the total calories of casein ingested 96.6 percent were digestible and 80.8 percent were metabolizable. The following factors were determined for computing the gaseous exchange and the heat production in the metabolism of casein: 1 g of urinary nitrogen equals 6.67 l of respiratory O_2, 5.47 l of CO_2, and 30.59 Calories.

The energy metabolism of the albino rat in relation to the plane of nutrition, E. B. Forbes, M. Kriss, and R. C. Miller (*Jour. Nutr., 8 (1934), No. 5, pp. 535–552, figs. 3*).—The Pennsylvania Institute of Animal Nutrition conducted respiration experiments with 8 male albino rats with an initial body weight of about 100 g at 4 planes of nutrition ranging from fasting to full feed. A commercial mixed calf meal was used for the diet. The rats were established on the desired plane of food intake before the respiration measurements were made. The activity of the rat was restricted during the experiments by inclosure in a rather close-fitting galvanized screen cylinder within the chamber. The hourly heat production and the total respiratory quotients varied little for any given dietary treatment.

The average daily heat production per 100 g of empty body weight was 12,720 calories for fasting, 14,736 calories with 4 g of food, 16,128 calories with 6 g of food, and 19,824 calories with 8 g of food per day. The average increments in heat production between fasting and the respective food levels were 504, 568, and 888 calories per gram of food consumed. The results showed a progressive increase in the rate of rise of heat production with increase in food consumption within certain limits. The same general relationship appeared to exist between food consumption and heat production in the rat, rabbit, steer, and human being.

[Determinations of the digestibility of the nutrients of hay and protein feeds, I, II], H. Isaachsen, O. Ulvesli, and M. Husby (*Meld. Norges Landbr. Høiskole., 15 (1935), No. 2, pp. 137–229, figs. 4; Eng. abs., pp. 218–221, 228*).—These studies were conducted at the Royal Agricultural College of Norway.

I. *Composition, digestibility, and feeding value of hay cut at different stages of maturity* (pp. 137–221).—A mixture of timothy and clover was cut for hay at the following times—(1) as the timothy was heading, (2) when the timothy began blooming, and (3) 14 days after the second cutting when the timothy had shed its blooms and some of the clover had turned brown.

The total feeding value of the crop varied according to where it was grown and the season. The amount of hay cut increased from the first to the third cutting time, while the amount of aftermath decreased from the first to the third cutting. The value per kilogram of hay and the percentage content of digestible true protein decreased between the first and third cuttings. On the whole, the results seemed to indicate that cutting when the timothy begins to blossom gives the greatest yield of feed units as well as of digestible true protein.

II. *Comparison of the digestibility of protein found in experiments with animals and in digestion trials with pepsin-hydrochloric acid* (pp. 222–228).—A considerable variation was found in the digestion coefficients of protein obtained by the pepsin-hydrochloric acid method. With hay, pasture grass, and grasses at different stages of maturity much higher coefficients were found with this method than were obtained with sheep. In seven samples of mountain hay the coefficients obtained by artificial digestion were lower than with animals, while with timothy straw and forest hays the artificial coefficients were so high that they were useless. The lower the protein content of grasses, the greater were the differences between animal and artificial results. The two methods gave comparable results with protein-rich feeds of animal origin.

The digestible nutrient content of Napier grass silage, Crotalaria intermedia silage, and Natal grass hay, W. M. Neal, R. B. Becker, and P. T. D. Arnold (*Florida Sta. Bul. 279 (1935), pp. 26*).—Continuing this series of investigations (E. S. R., 73, p. 842), it was found that Napier grass, harvested when the seed stalks began to appear, was low in crude protein and high in crude fiber. Silage made from this grass furnished 0.34 percent of digestible crude protein and 14.38 percent of total digestible nutrients. On a dry matter basis it furnished only two-thirds as much total digestible nutrients as corn silage. *C. intermedia* cut in the bud and early-bloom stage made palatable silage containing 2.08 percent of digestible crude protein and 10.72 percent of total digestible nutrients. It was felt that if this legume were cut in the prebud or early-bloom stage it would probably make a higher quality feed.

Late-cut Natal grass hay was low in digestible crude protein, but practically equal to timothy hay in total digestible nutrients.

Data as to dried grapefruit and orange cannery refuse (E. S. R., 73, p. 95) are also summarized and discussed.

Appended are tables giving the details of the experiments.

Commercial feeding stuffs, H. R. Kraybill et al. (*Indiana Sta. Circ. 210 (1935), pp. 28, fig. 1*).—This is the condensed report of commercial feed inspection for 1934. A table lists the results of the examination of 2,659 samples of feeds and shows the number of samples incorrectly guaranteed, seriously deficient, or misbranded (E. S. R., 72, p. 88), definitions, etc.

The assimilation of phosphorus from dicalcium phosphate, C. P., tricalcium phosphate, C. P., bone dicalcium phosphate, and cooked bonemeal, K. V. Rottensten and L. A. Maynard (*Jour. Nutr., 8 (1934), No. 6, pp. 715–730*).—A series of three experiments with rats was conducted at the [New York] Cornell Experiment Station in which the phosphorus intake was kept at a minimum level and the calcium-phosphorus ratio was held constant. In the first experiment dicalcium phosphate C. P. and cooked bone meal were compared by the paired feeding method at three levels of phosphorus intake. In the second experiment, using the same methods, dicalcium phosphate C. P., bone dicalcium phosphate, and tricalcium phosphate C. P. were compared, while in the third experiment bone dicalcium phosphate and cooked bone meal were compared using female rats carried from weaning through their first lactation. In all these experiments the usefulness of the supplement was measured by the data for ash content of the bones.

In the last experiment the rats receiving the supplements reared a greater weight of young, but their bones remained much higher in both percentage and amount of ash than did those of the control group receiving no supplement. This evidence of a better state of calcium and phosphorus nutrition was confirmed by evidence showing a higher level of inorganic phosphorus in the blood. In all experiments the evidence favored a secondary phosphate over a tertiary product, but the differences were small and the individual data variable. It seemed that any differences which might exist were not large enough to be appreciably important in the selection and use of mineral supplements in practice.

Synthetic diets for Herbivora, with special reference to the toxicity of cod-liver oil, L. L. Madsen, C. M. McCay, L. A. Maynard, G. K. Davis, and J. C. Woodward (*[New York] Cornell Sta. Mem. 178 (1935), pp. 53, pls. 3, figs. 13*).—In this investigation various synthetic diets have been formulated and their suitability studied for guinea pigs, rabbits, goats, and sheep. A total of approximately 200 animals has been used in the work. One diet free of hay or grain was developed on which sheep were raised successfully from weaning and maintained for a period of 480 days. The development of the body as a whole and all its parts was very nearly normal on this diet. Goats fed the same diet were raised from weaning and maintained for 580 days, but their development was less satisfactory. With guinea pigs and rabbits the results were distinctly less successful.

With rabbits and guinea pigs and to a less extent with goats, a characteristic symptom of failure on this diet was the development of a paralysis. Histological study showed this condition to be due to a degeneration of the skeletal muscles. The heart muscle was often involved, especially in the goat, and a fatty liver was a characteristic finding. The symptoms were first noted in diets containing cod-liver oil, and the substitution of a vitamin A-D concentrate markedly delayed the onset and lessened the severity but did not eliminate the symptoms. It was demonstrated that cod-liver oil and some other factor in the diet were the causative agents, since the entire elimination of a cod-liver oil product did not entirely inhibit the production of the lesions. On the other hand, adding cod-liver oil to the diet of natural foods produced the typical muscle lesions in guinea pigs, goats, and sheep.

Sheep and goats on daily intakes of 0.7 g of cod-liver oil per kilogram of live weight died on pasture within 93 days with the characteristic lesions. A level of 0.35 g produced similar results within 226 days, but a level of 0.1 g caused no ill effects under the same conditions over this period. The low level proved toxic to a goat on a synthetic diet, but not to a sheep when fed for 480 days.

The need of sheep and goats for some vitamin B factor was demonstrated, and evidence was obtained that a high level of yeast reduced the injury in goats produced by a synthetic diet containing cod-liver oil.

A new toxicant occurring naturally in certain samples of plant foodstuffs, I–IV (*Jour. Nutr., 8 (1934), Nos. 5, pp. 597–613, figs. 12; 6, pp. 615–632, figs. 6*).—These studies were conducted at the South Dakota Experiment Station. Related work, noted by Byers, is abstracted on page 102.

I. *Results obtained in preliminary feeding trials*, K. W. Franke.—A nutritional disturbance associated with plant material from particular localities is described. The author felt that the effects were probably produced by a definite toxic compound or compounds. Various cereal grains, including corn, wheat, barley, and emmer, from infected areas produced death in 299 out of

325 rats within 100 days. The pathological effects produced by the toxic materials are described.

II. *The occurrence of the toxicant in the protein fraction*, K. W. Franke.—In this phase of the study work was undertaken to determine which fraction of the grain carried the toxic material. Wheat and corn were fractionated, and feeding trials were conducted using residues from the extracts. The results showed that the toxicant was carried in the protein fraction of the grains.

III. *Hemoglobin levels observed in white rats which were fed toxic wheat*, K. W. Franke and V. R. Potter.—Experimental work was undertaken to determine the hemoglobin levels in rats about to die and to determine the rate at which the anemia associated with the toxic material progressed. A total of 19 rats was fed a complete ration, except that it contained toxic wheat.

All of the animals on this ration died. The first six deaths occurred with no decline in hemoglobin, and the last 13 occurred with hemoglobin levels ranging from 2 to 10.8 g per 100 cc of blood. In the latter case the fall in hemoglobin extended over periods ranging from 14 to 34 days. The anemia observed was not due to inanition.

IV. *Effect of proteins on yeast fermentation*, K. W. Franke and A. L. Moxon.—This phase of the investigation was undertaken to develop a simple biological test for the toxic substance and to study the possible effects of the toxic proteins on several of the important enzymes of the body.

It was found that when added to a fermenting mixture of yeast and glucose protein from a "normal" grain increased the rate of the reaction. The addition of protein from a "toxic" grain did not increase the rate of fermentation. Wheat protein appeared to have a greater stimulating effect in this respect than corn protein. The accelerating effect of protein varied with the protein-yeast ratio.

Ground flax and other protein supplements with corn for fattening calves and pigs, J. W. Wilson and T. Wright (*South Dakota Sta. Bul. 293* (*1935*), *pp. 30, figs. 5*).—This bulletin contains the results of two experiments.

I. [*Fattening calves with ground soybeans, ground flax, soybean oil meal, and linseed meal*].—A series of three tests was undertaken in which five lots of steers were fed a basal ration of shelled corn and alfalfa hay for 148, 228, and 239 days, respectively. In addition to the basal ration the lots received the following supplements: None, linseed meal, ground flaxseed, soybean oil meal, and ground soybeans. Feeding a protein supplement reduced the corn required per unit of gain. Ground flax and ground soybeans could be used to advantage for this purpose, and the calves fed the ground soybeans shed their coats earlier than those in the other lots. Difficulties were experienced in keeping the calves fed ground flaxseed on full feed, and it is advisable that not much more than 1 lb. of this feed be given per head daily. Calves fed ground soybeans and ground flaxseed produced more soft carcasses than those in the other lots.

II. *Ground flax compared with linseed meal and tankage for fattening pigs*.—In this study six lots of pigs were fed in each of three experiments on a basal ration of shelled corn, alfalfa hay, and a mineral mixture. In addition the respective lots received the following supplements: None, tankage, equal parts of tankage and linseed meal, equal parts of tankage and ground flaxseed, ground flaxseed, and linseed meal. Both tankage and linseed meal proved to be more economical supplements than ground flaxseed. Feeding tankage with ground flaxseed increased the efficiency of this supplement. The mixture containing tankage reduced the amount of corn required per 100 lb. of gain, but did not reduce the amount of tankage needed. Ground flaxseed tended to produce soft pork.

Results of feeding sprouted oats to correct sterility in cattle and swine, L. A. Henke (*Jour. Agr. Res.* [*U. S.*], *51* (*1935*), *No. 1*, *pp. 51–59*).—The Hawaii Experiment Station undertook studies on feeding sprouted oats to determine whether they contain a vitamin or other substance which by reason of preventing reabsorption of the embryo or other beneficial action caused animals that were temporarily sterile to again become pregnant.

Out of 38 cows with irregular breeding behavior to which sprouted oats were fed, 82 percent produced calves. Of 37 cows with like history that were not fed sprouted oats, 76 percent produced calves. A group of 15 sows with irregular breeding behavior was fed sprouted oats and 87 percent produced litters, while with 16 similar sows not fed oats 75 percent produced litters. In one case, 3 of 5 sows that were fed sprouted oats after having failed to conceive for a long period in the control groups finally produced litters. While there were some indications in this last case of a beneficial effect from feeding sprouted oats to shy breeders, the evidence for the study as a whole by no means conclusively showed that sprouted-oats feeding was helpful in correcting sterility in cattle and swine.

Alfalfa meal v. long alfalfa for fattening steers, R. R. Thalman (*Nebr. Univ., Anim. Husb. Dept., Cattle Circ. 150* (*1934*), *pp. 3*).—For this test yearling steers averaging 631 lb. per head were divided into three lots of 12 head each and fed for 196 days on a basal ration of cracked corn. In addition, the respective lots received long alfalfa hay, alfalfa meal, and alfalfa meal plus 1 lb. of cottonseed cake. The average daily gains in the respective lots were 2.2, 2.2, and 2.3 lb. per head. In general there were no significant differences between the lots. The determining factor in the choice of ground hay over long hay depends upon the relative price of alfalfa and corn. The advisability of adding cottonseed cake also depended upon price conditions. In this trial 43 lb. of cake saved 14 lb. of hay and 54 lb. of corn for each 100 lb. of gain.

Grinding shelled, ear, and snapped corn for yearling steers, R. R. Thalman and R. B. Cathcart (*Nebr. Univ., Anim. Husb. Dept., Cattle Circ. 143* [*1934*], *pp. 10*).—Continuing this test (E. S. R., 73, p. 521), 4 lots of 10 yearling steers each, averaging 671 lb. per head, were fed for 180 days on a basal ration of alfalfa hay. In addition the respective lots received shelled corn, cracked shelled corn, ground ear corn, and ground snapped corn for 80 days, ground ear corn for 60 days, and cracked shelled corn for 40 days. The average daily gains in the respective lots were 2.2, 2.3, 2.5, and 2.4 lb. per head.

While the steers fed cracked corn consumed 2 percent more corn and 2 percent less hay and made 3.5 percent faster gains than those fed whole corn, the differences in efficiency were overcome by the grinding costs. All of the cattle made very efficient use of their feed. The cob and the cob and husk were all about equal in reducing the high requirements per 100 lb. of gain. Steers fed the bulky rations went on full feed more rapidly than those on the more concentrated rations. About twice as much pork was produced in lot 1 as in any other lot. The market value of the cattle was highest in lot 4, while the carcasses in lot 1 were slightly inferior to those in the other lots.

Digestion studies on grinding snapped, ear, and shelled corn for yearling steers, R. R. Thalman and R. B. Cathcart (*Nebr. Univ., Anim. Husb. Dept., Cattle Circ. 144* [*1934*], *pp. 16*).—The above test was supplemented with digestion studies using eight head of similar steers full-fed individually the same rations for 180 days. Three 10-day digestion trials were conducted with these animals using the paired-feeding method. There was little difference between the corn rations within each pair, either from the standpoint of coefficients of digestibility or percentage of ingested corn grain that passed through the digestive tract. The results were not deemed conclusive enough to show the relative feeding value of the rations.

The evolution of the sirloin, C. S. PLUMB (*Indiana Sta. Circ. 209 (1935), pp. [17], figs. 2*).—In this article the author traces the development of animal husbandry from its early beginnings in England, laying particular stress upon the production of beef and the origin of the cut known as the sirloin.

The Idaho caliper for measuring inequalities in the jaws of sheep, J. E. NORDBY (*Natl. Wool Grower, 25 (1935), No. 5, p. 19, fig. 1*).—In this article from the Idaho Experiment Station the author describes a modification of a standard vernier caliper for measuring jaw defects in sheep.

Wool-growth in sheep as affected by the carbohydrate-content of the diet, II, A. H. H. FRASER and J. E. NICHOLS (*Empire Jour. Expt. Agr., 3 (1935), No. 9, pp. 75–79, fig. 1*).—Continuing this investigation (E. S. R., 73, p. 221), the maintenance lot of 10 sheep was divided into two subgroups of five head each. One of these groups was continued on the maintenance ration for 117 days, during which time they grew wool at the rate of 2.3 g per sheep per day. During 98 days of the experimental period the sheep in the second group received 98 lb. of starch per head in addition to the basal ration and produced wool at the rate of 4.7 g per day. The increase was chiefly due to the greater thickness of the individual wool fibers. It is concluded that although wool fiber is a protein substance, under certain conditions its growth is greatly influenced by the carbohydrates in the animal's diet.

A comparison of three forms of maize as sheep feed, L. L. ROUX and C. T. VAN RENSBURG (*Farming in So. Africa, 10 (1935), No. 108, pp. 106, 107, fig. 1*).—A comparison of whole, crushed, and meal maize (corn) at Ermelo, Union of South Africa, showed that they were equal in feeding value for Merino ewes when fed in conjunction with teff hay and a bone meal and salt lick. A ration of 4 oz. of corn, 2.5 lb. of teff hay, and a bone meal and salt lick consumed at the rate of 4 oz. per head per week was satisfactory for wintering Merino ewes weighing approximately 61 lb. This ration could be fed over an extended period without affecting the general health or reproductive ability of the sheep.

Silage, bone meal, tankage, meat scraps, and straw in rations for fattening lambs, M. A. ALEXANDER (*Nebr. Univ., Anim. Husb. Dept., Sheep Circ. 328 [1935], pp. 5*).—Lambs averaging approximately 64.5 lb. per head were divided into six lots of 30 head each and were fed for 107 days on a basal ration of cracked shelled corn. In addition, the respective lots received chopped alfalfa hay; cottonseed meal and Atlas silage; cottonseed meal, Atlas silage, and steamed bone meal: digester tankage and Atlas silage; meat scrap and Atlas silage; and cottonseed meal, steamed bone meal, and wheat straw. The average daily gains in the respective lots were 0.4, 0.3, 0.4, 0.4, 0.4, and 0.3 lb. per head. The feed cost per 100 lb. of gain was larger in the corn and alfalfa lot than in the lots receiving silage supplemented with proteins and minerals. Adding bone meal to the silage ration increased the rate and efficiency of gains. There was no significant difference in the results obtained when tankage, meat scrap, or cottonseed meal were used as protein supplements to the silage ration. Wheat straw supplemented with cottonseed meal and bone meal produced better gains than silage supplemented with cottonseed meal, but this advantage was overcome when bone meal was added to the cottonseed meal in the silage ration. The lot receiving straw produced fewer high-grade carcasses than the other lots.

Studies on the carbohydrate metabolism of the goat: The blood sugar and the inorganic phosphate, J. T. CUTLER (*Jour. Biol. Chem., 106 (1934), *No. 2, pp. 653–666, figs. 6).*—In this study it was found that the normal resting blood sugar of goats was between 24 and 65 mg per 100 cc. The blood sugar changes following excitement, the administration of adrenalin, or sugar were similar to those observed in the dog. In order to produce shock in goats from the administration of insulin, it was necessary to maintain the blood sugar level between 10 and 20 mg per 100 cc for 5 to 8 hr. The administration of glucose, adrenalin, or insulin markedly lowered the inorganic phosphorus of goat blood.

Value of present-day swine types in meeting changed consumer demand, S. Bull, F. C. Olson, G. E. Hunt, and W. E. Carroll (*Illinois Sta. Bul. 415 (1935), pp. 257–295, figs. 10*).—Continuing this series of investigations (E. S. R., 61, p. 460), this study was undertaken in an effort to determine how well present-day types of hogs meet the market demand for a carcass that will cut out small, lean, firm cuts, a finished belly, and a minimum amount of lard. In this work 14 chuffy hogs were fed out and slaughtered at 170 lb., and 14 chuffy, 10 rangy, 10 intermediate, and 10 very chuffy hogs were fed out and slaughtered at 200 lb.

There were no significant differences in the rate or economy of gains between the various types, and the dressing percentages were similar although the very chuffy hogs dressed somewhat higher. None of the types met effectively the present market carcass demands. The intermediate type approached this ideal most nearly, with the chuffy, rangy, and very chuffy following in the order named. The authors conclude that the ideal hog would have the quality and firmness of the intermediate, the length of the rangy, and the early maturity of the chuffy types.

Tables and illustrations present the details of the study.

Carcass quality of the pig in relation to growth and diet, E. H. Callow (*Empire Jour. Expt. Agr., 3 (1935), No. 9, pp. 80–104, pls. 3, figs. 3*).—In this paper from the Low Temperature Research Station, Cambridge, the author reviews the literature dealing with the growth and conformation of the pig, the effect of diet on growth and carcass composition, the composition of deposited fat, the effect of diet on muscular tissue and bone, the quality of carcass and fat, and measurements of carcass quality, and suggests factors that need further consideration.

The vitamin A requirement of swine, G. Dunlop (*Jour. Agr. Sci. [England], 25 (1935), No. 2, pp. 217–230, fig. 1*).—Experiments were conducted at the University of Cambridge to obtain information on the types and amounts of common foodstuffs that should be fed to prevent avitaminosis A in swine. The actual vitamin A requirements of swine in terms of carotene were also studied.

Three animals were placed on each of 10 different rations, seven of which produced typical symptoms of vitamin A deficiency, two contained the minimal or just subminimal amounts of the vitamin, while one appeared to permit storage. The rations on which there were no symptoms of vitamin A deficiency contained corn meal and alfalfa meal. Both of these foodstuffs produced undesirable effects when fed at levels necessary to prevent the onset of disease symptoms, and neither were standard products. On this basis the dosing of young animals with a concentrate of known potency (1,000,000 international units of vitamin A per animal) appeared to be the simplest and surest method of preventing avitaminosis A under an intensive system of management. Post-mortem examination of four animals that died showed extensive enteritis. The amount of vitamin A required to keep the animals' reserves at their original level was approximately 60 mg of carotene per 100 lb. of feed or 4 mg of carotene per day for a 100-lb. pig.

On the ration high in corn meal growth ceased in all three animals. Small supplements of yeast were sufficient for recovery and resumption of normal growth, indicating that the condition was due to a deficiency of vitamin B_1.

A study of the fasting metabolism of various breeds of hog, I, II, T. DEIGHTON (*Jour. Agr. Sci.* [*England*], *24* (*1934*), *No. 2, pp. 326–334, pls. 4; 25* (*1935*), *No. 2, pp. 180–191, figs. 3*).—These studies were carried on at the Institute of Animal Nutrition, University of Cambridge.

I. *Introductory: Age, weight, and length data, etc.*—The author reports observations on the age, weight, and length of a total of 25 pigs of 9 different breeds from about 50 days of age up to an age well beyond that to which such animals are kept by the producer. The metabolism of individuals was observed during fasts varying in length from 2 to 5 days. A series of figures illustrates graphically how the individual animals varied from the mean growth for each of the factors under consideration.

II. *Body temperature measurements.*—It was found that the normal body temperature of the pigs varied appreciably more than was considered normal. The limits lay between 98.3° and 104.8° F., and the variation was independent of environmental temperature or season of the year. The average for the adult hog was 101.7°. Fasting for 2 to 5 days caused a reduction of body temperature in most cases, amounting on the average to 1.7°. Whether normal or fasting, the mean body temperature of the young pig was about 1.5° higher than that of the adult hog.

It is concluded that the reduction in body temperature during fast was independent of breed, age, weight, surface, loss in fasting, fall in metabolism in fasting, environmental temperature, and light. Individual variations were great, and mental excitement as well as amount of muscular energy expended within an hour or so before the measurements were taken had a marked effect on the temperature. The hog, like rats and guinea pigs, was found to be an incompletely thermoregulated animal.

Experiments in table poultry production ([*Gt. Brit.*] *Min. Agr. and Fisheries Bul. 91* (*1935*), *pp. V+59, figs. 9*).—The results of studies on the production of table poultry conducted at South-Eastern Agricultural College, Wye, during the period 1925–32 are presented.

In this work it was found that the heaviest weights, 5 to 5.5 lb., were reached by the table breeds at 25 weeks of age. Although at the earlier ages and at 25 weeks Rhode Island Reds were not greatly inferior to the Light Sussex breed or table crosses, at practically every age the table breeds were definitely superior to the egg breeds. Dry mash as a rearing ration gave better results than wet mash, but there was no difference between a dry mash and a combination of wet and dry mash. Dry mash feeding required less labor than wet mash feeding. Barley meal and corn could be successfully substituted for part of the Sussex ground oats, and dried skim milk could be reduced 50 percent from the usual level of feeding. These changes reduced the cost of feeding without reducing the gains or the quality of the finished bird.

Appended is a note on the starch equivalent required to produce 1 lb. of live weight increase during trough feeding and cramming by E. T. Halnan.

The effect of supplementary iodine on the nutritive value of chick rations, A. D. HOLMES, M. G. PIGOTT, and W. H. PACKARD (*Jour. Nutr.*, *8* (*1934*), *No. 6, pp. 583–595, figs. 4*).—In this study 5 pens of 30 Rhode Island Red chicks each were fed a chick growing mash from hatching to 12 weeks of age under standardized laboratory conditions. The diet of 4 pens was supplemented with 18.8, 37.5, 75, and 93.8 mg of KI per kilogram of mash. Observations were made on growth, physical appearance, and feed consumption, on the nutritive efficiency of the diets, on the bone growth, and on hemoglobin content of the blood at 12 weeks of age.

The final weight of the chicks did not vary consistently with the amount of iodine fed. The mash consumption was greatest for the pen receiving the most KI, but in physical appearance the pens were similar. The mash containing 37.5 mg of KI had the highest nutritive efficiency. The length and diameter of tibias were greatest in the lot receiving the most KI, but the heaviest tibias were from the pen receiving 18.8 mg and the ash content was largest for the chicks in the pen receiving 37.5 mg of KI. The internal structure of the tibias showed the same development in all pens. The hemoglobin content was greatest in the control pen.

The relation between the antirachitic factor and the weight of the gall bladder and contents of the chicken, W. C. RUSSELL, M. W. TAYLOR, and D. F. CHICHESTER (*Jour. Nutr., 8 (1934), No. 6, pp. 689–694*).—An investigation at the New Jersey Experiment Stations showed that the average weight of the gall bladders and contents of a group of White Wyandotte chicks deprived of the antirachitic factor was more than twice that of a group provided with an adequate amount of the factor. The average weight of the gall bladders of a group of chicks partially protected against leg weakness was intermediate between the values for a normal group and for a group deprived of the antirachitic factor. The average pH concentration of the duodenal contents was practically the same whether the groups had an adequate amount or were deprived of the antirachitic factor. The pH apparently was not related to the retention of bile by the gall bladder.

The total solids of the bile of birds receiving an antirachitic factor was practically constant throughout the test, while the value for the basal group increased with age. The ash percentage fluctuated in the group protected from leg weakness, but there was a tendency toward an increase in ash with age in the basal group. Calcium expressed as milligrams per 100 g of bile was from 25 to 35 percent lower in the basal than in the protected group. However, the volume of bile in the basal group at 8 weeks of age was about twice that of the protected group. It was thought that the bile might be an important excretory route for calcium when animals were affected with leg weakness.

Three hatches a year, D. C. KENNARD and V. D. CHAMBERLIN (*Ohio Sta. Bimo. Bul. 175 (1935), pp. 159–161*).—The advantages of hatching chicks during the periods (1) January and February, (2) April and May, and (3) September and October are discussed, with particular emphasis on the advantages of fall hatching.

DAIRY FARMING—DAIRYING

[Abstracts of papers presented at the 29th annual meeting of the American Dairy Science Association] (*Jour. Dairy Sci., 18 (1935), No. 7, pp. 429–482*).—Contributions presented at the annual meeting of the association (E. S. R., 72, p. 522) held at St. Paul, Minn., June 1935, include the following in the production and manufacturing sections: The Involution of the Mammary Gland, by E. P. Reineke and C. W. Turner (pp. 429, 430); The Ovary-stimulating Interaction of Blood Serum from Cattle and Gonadotrophic Extracts, by L. E. Casida (p. 430); A Review of Color Inheritance in Dairy Cattle, by H. L. Ibsen and H. W. Cave (pp. 430, 431); The Dietary Requirements of Goats for Vitamin E, by J. L. Wilson, B. H. Thomas, and C. Y. Cannon (pp. 431, 432); A Preliminary Study of the Vitamin D Requirement of Calves When Fed Natural Milk as the Source of This Vitamin, by C. F. Huffman and C. W. Duncan (p. 432); The Pathology of Rickets in Dairy Calves, by H. E. Bechtel, E. T. Hallman, and C. F. Huffman (pp. 432, 433); The Color and Carotene

Content of Various Home-grown Roughage Rations and the Influence of These Rations on the Color, Carotene, and Vitamin A Potency of the Butterfat, by R. E. Hodgson, J. C. Knott, H. K. Murer, and R. R. Graves (pp. 433, 434); The Vitamin A Activity of Butter Produced by Cows Fed Alfalfa Hay and Soybean Hay Cut in Different Stages of Maturity, by J. H. Hilton, J. W. Wilbur, and S. M. Hauge (p. 434); Caratone in Rations for Dairy Calves, by A. H. Kuhlman, W. D. Gallup, and E. Weaver (pp. 434, 435); Blindness in Cattle of Nutritional Origin Associated with Constriction of the Optic Nerve, by L. A. Moore, C. F. Huffman, and C. W. Duncan (p. 435); A Study of the Malnutrition Incident to the Heavy Feeding of Cottonseed Meal, by S. I. Bechel and S. R. Skaggs (pp. 435, 436); Influence of the Ration on the Vitamin C Content of Milk, by W. H. Riddell, C. H. Whitnah, and J. S. Hughes (p. 437); Effect of the Condition of Corn Plant at Cutting upon the Carotene Content of Silage, by E. A. Kane and C. A. Cary (p. 437); The Stack Silage Method of Preserving Forage Crops and the Comparative Nutritive Value of Oat and Pea Silage Made in a Stack and in a Tower, by J. C. Knott, R. E. Hodson, and R. R. Graves (p. 438); Pea Vine Silage as a Feed for Dairy Cattle, by J. O. Tretsven (pp. 438, 439); Studies Regarding the Use of Mineral Acids for the Preservation of Forage (pp. 439, 440); Molasses as a Preserving Agent in Making Soybean Silage, by E. C. Elting (p. 440); Experimental Cottonseed Meal Ration Plus Silage versus Herd Ration, Hay, and Silage Feeding, by R. H. Lush (pp. 441–442); The Digestibility and Feeding Value of Russian Thistle Hay, by H. W. Cave, W. H. Riddell, and J. S. Hughes (pp. 442, 443); *Lespedeza sericea* Feeding Trials with Dairy Cows, by C. E. Wylie and S. A. Hinton (p. 443); The Effect of Soybeans on the Fat Content of Milk, by J. W. Wilbur, J. H. Hilton, et al. (pp. 443, 444); The Effect of Quality and Level of Protein Intake upon Growth and Milk Production, by I. W. Rupel, G. Bohstedt, and E. B. Hart (pp. 444, 445); Milk and Butterfat Production on High and Low Protein Rations, by C. A. Cary (p. 445); Extremes in Protein Feeding—Bearing of the Results on the Protein-feeding Standard, by A. E. Perkins (pp. 445, 446); Changes in Weight of New-born Calves as Related to the Method of Feeding, by C. L. Cole (pp. 446, 447); The Nutrients Required by Dairy Cows Kept in an Open Shed vs. Cows Kept in a Dairy Barn, by J. R. Dice (pp. 447, 448); Formulae for Calculating Rations for Milk Cows, by A. H. Kuhlman (pp. 448, 449); Permanent Records in the Station Herd, by R. B. Becker (p. 449); Effect of Breeding Efficiency and Culling on Herd Production, by L. Copeland (p. 450); Studies on the Ash and Nitrogen Distribution of Processed Cheese as Affected by the Salts Used and a Comparison of the Methods Used for the Determination of the pH of the Cheese, by H. L. Templeton (p. 451); Effects of Some Ions on the Properties of Ice Cream Mixes, by J. I. Keith, C. W. Rink, and E. Weaver (pp. 451, 452); The Hydrogen-ion Concentration and Titratable Acidity of Butter, Cream, and Buttermilk, by O. F. Hunziker and W. A. Cordes (pp. 452–455); Range of Hydrogen-ion Concentration in Sour Cream Butter, by E. H. Parfitt (p. 455); The Thiocyanogen Value as a Means of Measuring Unsaturated Fatty Acids in Butterfat, by O. J. Hill and L. S. Palmer (pp. 455, 456); The Effect of Homogenization on Some of the Fat Constants of Milk, by I. A. Gould and G. M. Trout (p. 456); Variations in Physical Properties of Milks, by G. P. Sanders, K. J. Matheson, and L. A. Burkey (pp. 456, 457); Soft Curd Character Induced in Milk by Intense Sonic Vibration, by L. A. Chambers (p. 457); Variations in the Curd Tension of the Milk throughout the Complete Lactation Period, by M. H. Berry (p. 458); Effect of Mastitis upon Milk Quality and Composition, by P. A. Downs (pp. 458–460); The Relation of Mastitis to the Rennet Coagulability and Strength of Milk, by H. H. Sommer and H. Matsen (pp. 460, 461); Structural Changes

Occurring in Casein during Cheese Ripening as Shown by X-ray Diffraction Studies, by S. L. Tuckey, H. A. Ruehe, and G. L. Clark (pp. 461, 462); Effects of Time and Temperature of Holding Milk Heat-treated at Various Temperatures upon its Subsequent Coagulation by Rennet, by M. E. Powell (pp. 462, 463); Determinations of Copper in Sugar Condensed Milk and Some Relations between the Copper Content and Off Flavor in Strawberry Ice Cream, by H. L. Link, H. J. Konen, and L. A. Baumann (p. 463); The Application of the Minnesota Babcock Method to the Testing of Ice Cream, Concentrated Milk, and Chocolate Milk, by L. M. Thurston and W. C. Brown (p. 464); The Standardization of the Borden Body Flow Meter for Determining the Apparent Viscosity of Cream, by J. C. Hening (p. 465); Judging Sweet Cream, by J. H. Nair, D. E. Mook, and R. S. Fleming (pp. 465, 466); Some Factors Affecting the Properties of Whipped Cream, by W. S. Mueller, M. J. Mack, and H. G. Lindquist (pp. 466, 467); Frequency of the Flavor Defects in Milk, by E. Weaver, E. L. Fouts, and P. C. McGilliard (pp. 467–468); Effects of Feeds on Oxidized Flavors in Pasteurized Milk, by E. Prewitt and E. H. Parfitt (p. 468); Methods of Studying Feed Effects on the Physical Properties of Butterfat, by W. D. Gallup, J. I. Keith, and A. H. Kuhlman (pp. 468, 469); Effect of a Heavy Cottonseed Meal Ration on Milk and Butter, by J. I. Keith, A. H. Kuhlman, E. Weaver, and W. D. Gullup (p. 469); The Detection and Control of Bovine Mastitis, by G. J. Hucker (pp. 469, 470); Studies on Aseptically Drawn Milk from Bang's Disease Positive and Bang's Disease Negative Cows, by H. B. Morrison and F. E. Hull (pp. 470, 471); Bitter Flavor in Cheddar Cheese Made from Pasteurized Milk, by C. A. Phillips (pp. 471, 472); Study of a Gassy Defect in Cream Cheese, by W. J. Corbett, W. C. Frazier, and W. V. Price (pp. 472, 473); Varieties of the Genus *Oospora* Found in Cream and Butter, by C. M. Sorensen (p. 473); The Disappearance of Acetylmethylcarbinol and Diacetyl in Butter Cultures, by G. L. Stahly, M. B. Michaelian, C. H. Werkman, and B. W. Hammer (pp. 473, 474); A Study of *Escherichia-Aerobacter* Organisms in Pasteurized Milk, by J. L. Minkin and L. H. Burgwald (p. 474); Observations on Yeasts Causing Gas in Sweetened Condensed Milk, by H. C. Olson and B. W. Hammer (pp. 474, 475); Standard Laboratory Methods for the Control of Dairy Products, by R. S. Breed (p. 475); Acidity in the Manufacture of Cream Cheese, by Z. D. Roundy and W. V. Price (pp. 475, 476); The Manufacture of a Soft Cheese of the Bel Paese Type, by R. R. Farrar (pp. 476, 477); Experiments with Canned Cheddar Cheese, by E. L. Reichart (pp. 477, 478); The Vitamin A Content of Sour Cream Butter, Sweet Cream Butter, and Margarine, by I. L. Hathaway and H. P. Davis (p. 478); Technic, Examination, and Reporting Extraneous Matter in Butter, by B. E. Horrall (pp. 478, 479); Notes on the National Cream Quality Improvement Campaign, by M. E. Parker (p. 479); Comparative Efficiency of Electrically Operated Tanks versus Ice in the Cooling of Milk, by J. H. Frandsen (pp. 479, 480); Frozen Brines as Refrigerants for Ice Cream in Cabinets and Shipping Containers, by H. H. Sommer (pp. 480, 481); An Experimental Ice Cream Freezing Unit, by J. I. Keith and C. W. Rink (p. 481); and Methods for Testing Condensing Pans, by L. C. Thomsen (pp. 481, 482).

[Proceedings of the eighth annual State College of Washington Institute of Dairying] (*Wash. State Col., Inst. Dairying Proc., 8 (1935), pp. III+150, fig. 1*).—The following papers were presented at the eighth annual meeting, held at Pullman in February 1935 (E. S. R., 72, p. 241): A Review of Recent Cheddar Cheese Making Experiments, by N. S. Golding (pp. 8–10); Various Attempts Made in the State of Washington to Manufacture Foreign Types of Cheese, by W. J. Wyrick (pp. 10–13); Latest Developments in Vitamin Research of Interest to the Dairyman, by E. N. Todhunter (pp. 13–22); Vitamin

D Milk Developments, by F. B. McKenzie (pp. 22–25); Soft Curd Milk, by D. R. Theophilus (pp. 25–28); The Construction of a New Dairy Plant, by G. S. Perham (pp. 28–32); Various Methods of Grading Milk, by M. M. Miller (pp. 32–35); High Solids Ice Cream, by P. Young (pp. 35–45); Maintaining Ethical Standards in Dairy Manufacturing (pp. 45–51), Costly Butter Defects and Their Prevention (pp. 52–59), and What We Can Learn from the Dairy Industries in Denmark and New Zealand (pp. 59–64), all by O. F. Hunziker; Summary of the Monthly Educational Butter Scoring at the State College of Washington, by H. A. Bendixen (pp. 64–71); Opportunities Afforded the Dairy Industry through Dairy Council Program, by M. G. Flanley (pp. 71–75); A Phase of the Dairy Council School Program, by A. G. McPherson (pp. 75–77); The Standard Plate Method of Making Bacterial Counts in Milk, by M. W. Brandt (pp. 77–84); Safeguarding the Public Milk Supply, by F. E. Smith (pp. 84–86); A Discussion of the Washington State Butter Marketing Agreement, by R. S. Miller (pp. 87–89); Results of the Federal Cream Inspection in the State of Washington, by J. L. Harvey (pp. 89–93); Dairy Problems, by R. A. Cornelius (pp. 93–97); A Cream Quality Program, from the Farmer's as Well as Creameryman's Viewpoint, by O. J. Hill (pp. 98–100); Land Use in Washington, by R. E. Willard (pp. 100, 101); The Influence of Acids, Washing Powders, Chemical Sterilizers, and Refrigerating Brines on Metals, by O. F. Hunziker (pp. 102–109); The Relation of the Association Tester to the Extension Program, by F. E. Balmer (pp. 109–114); Dairy Outlook, by R. M. Turner (pp. 114, 115); Dairy Improvement Publicity, by W. D. Staats (pp. 116–118); The Producer and the Washington A. A. A., by D. Lamphier (pp. 118–120); Pasture and Pasture Management, by R. E. Hodgson (pp. 120–124); Roughages for Winter Milk Production, by J. C. Knott (pp. 124–127); Transmission and Detection of Mastitis, by C. C. Prouty (pp. 127–129); Possible Effect of Dairy Control Boards on the Breeding of Purebred Cattle, by H. A. Mathieson (pp. 129, 130); Sterility, by P. H. Blickenstaff (pp. 130–134); and Bang's Disease, by E. E. Wegner (pp. 134–140).

[Dairy cattle and dairy products experiments in Idaho] (*Idaho Sta. Bul. 217 (1935), pp. 8, 23–26, 27*).—Information was obtained on vitamin A value of pasture plants, vitamin A activity and the effect of the curing process on alfalfa hay, the detrimental effect of manure clumps upon the productive area of pastures, the use of cull potatoes, alfalfa seed screenings, and pea meal in dairy rations, sunflower silage as a substitute for corn silage, and sweetclover silage as a salvage crop.

It was also found that mastitis may affect milk composition, that the H-ion concentration of wash water for butter changed during the washing process, and that the insulating efficiency of ice cream packers varied greatly.

[Dairy husbandry studies in Minnesota, 1885—1935] (*Minnesota Sta. Bul. 319 (1935), pp. 16–19, 34–40, 72*).—Findings are briefly noted as to milk enzymes, powdered whole milk, cream rising and grading, the role of colloids in milk and its products, the vitamin content of milk, phosphorus and calcium deficiency, butter making, calf raising, dairy rations, and skim milk utilization.

[Experiments with dairy cattle by the North Carolina Station] (*North Carolina Sta. Rpt. 1933, pp. 52–55*).—Results obtained in tests with dairy cows are reported on lespedeza as a supplementary grazing crop for dairy cattle, kudzu and *Lespedeza sericea* as supplementary pasture for dairy cattle, *L. sericea* as a grazing crop for dairy cattle, and Kobe lespedeza and orchard grass as pasture plants, all by C. D. Grinnells, A. J. Pieters, and P. H. Kime; dairy cattle pasture studies at the Central Substation, by Grinnells and Kime; dairy cattle pasture studies at the Mountain Substation, by Grinnells, Kime,

S. C. Clapp, and H. Coulter; and the comparative value of alfalfa and lespedeza hay, by Grinnells and Pieters.

[Investigations with dairy cattle in Vermont] (*Vermont Sta. Bul. 396 (1935), pp. 21–23*).—Data obtained in studies with dairy cattle are reported on calcium and phosphorus metabolism, and the feeding value of artificially dried young hays.

Pea meal as a feed for dairy cows, F. W. Atkeson, T. R. Warren, and D. W. Bolin (*Idaho Sta. Bul. 213 (1935), pp. 14*).—Using the double reversal method of feeding, two groups of cows were fed in two tests of three 32-day periods each on a basal ration of alfalfa hay and sunflower silage. The grain ration used as a basis for comparison consisted of a mixture of 400 lb. of rolled barley, 200 lb. of wheat bran, 100 lb. of linseed meal, and 21 lb. of mineral mixture. In the experimental ration 200 lb. of pea meal was substituted for the linseed meal. The digestible crude protein and total digestible nutrient content of the two rations were practically the same.

There were no significant differences in feed consumption, milk production, changes in body weight, or efficiency of production on the two rations. While pea meal was not as palatable as some common cereals this is not deemed a limiting factor when grain mixtures containing up to 75 percent of pea meal are fed.

Potatoes as a feed for dairy cows, F. W. Atkeson and G. C. Anderson (*Idaho Sta. Bul. 216 (1935), pp. 14*).—In two feeding tests raw potatoes were compared with corn silage, using two groups of cows in each trial fed a basal ration of alfalfa hay and a grain mixture.

The consumption of the two succulent feeds and of grain was quite similar, but in each case the consumption of hay was greater when potatoes were fed. The changes in body weight and the milk production were practically the same for both feeds. Because of the higher consumption of hay when potatoes were fed, the total digestible nutrients consumed per 100 lb. of 4 percent milk produced were greater. On this basis potatoes were approximately 90 percent as efficient as corn silage for milk production.

In a third trial cooked potatoes were compared with raw potatoes. Feed consumption, milk production, and body weight changes were similar for both groups. However, since more digestible disturbances occurred when cooked potatoes were fed, it is recommended that potatoes be fed raw.

With care in feeding, at least 30 lb. of potatoes per day could be fed to Holstein cows and 25 lb. to Jerseys. Potatoes proved to be quite well relished by the animals. The milk produced by potato-fed cows was equal in flavor to that produced by cows fed corn silage. The butter from the two groups was excellent in body and texture, and no off flavors were present.

Apple pomace silage, A. E. Perkins and C. F. Monroe (*Ohio Sta. Bimo. Bul. 175 (1935), pp. 154–158, figs. 3*).—In this article the authors discuss the possibilities of using apple pomace silage for feeding dairy cattle. They conclude that it would seem to offer "a convenient and suitable source of supply of a valuable ingredient in a good dairy ration, particularly in the case of small herds . . . where it is not considered practical to provide a supply of corn silage."

Sunflower silage for milk production, F. W. Atkeson (*Idaho Sta. Bul. 215 (1935), pp. 8*).—Using the double reversal system of feeding, two groups of cows were fed in two tests of three 30-day periods each on a basal ration of alfalfa hay and a grain mixture. During the experimental periods one lot received sunflower silage and the other lot corn silage.

There was no significant difference in milk and fat production or the body weight changes on the two silages. On the basis of total digestible nutrients consumed and milk produced, sunflower silage was equal to corn silage. Although corn silage appeared to be more palatable than sunflower silage, cows consumed as much of the latter as they did of the former. Over a period of years it was found that in the Moscow, Idaho, area sunflowers produced 72 percent more tonnage of silage per acre than corn. Since in feeding value the two groups were practically equal, the choice remained one of more milk per acre rather than more milk per cow.

Sweet clover silage as a feed for dairy cows, F. W. ATKESON and G. C. ANDERSON (*Idaho Sta. Bul. 214 (1935), pp. 11*).—In order to determine the feeding value of sweetclover silage for milk production, two groups of four cows each were fed by the double reversal method for three 20-day experimental periods on a basal ration of alfalfa hay and a grain mixture. One lot received corn silage and the other sweetclover silage.

In the upper part of the silo the sweetclover silage was dark in color and had a characteristic coumarin odor, but it improved in quality as it was fed off. There was no significant difference in the milk production with the two silages. Sweetclover silage was not so palatable as corn silage. Good quality sweetclover silage did not taint milk and milk products any more than corn silage, but there was more chance of taints in these products due to poor quality sweetclover silage.

An examination of the value of covariance in dairy cow nutrition experiments, M. S. BARTLETT (*Jour. Agr. Sci.* [*England*], *25 (1935), No. 2, pp. 238–244*).—In this study at the Agricultural Research Station, Jealott's Hill, Berkshire, the results of an experiment on the nutritive value of dried grass for winter feeding of dairy cows were used as a uniformity trial to indicate the magnitude of the standard error that might be expected if a continuous treatment study were designed with a preliminary control period. On the basis of the analysis an initial period of 3 weeks was suggested. The author also presents some discussion on the design and analysis of this type of experiment.

The effects, on calcium and phosphorus metabolism in dairy cows, of feeding low-calcium rations for long periods, E. B. MEIGS, W. A. TURNER E. A. KANE, and L. A. SHINN (*Jour. Agr. Res.* [*U. S.*], *51 (1935), No. 1, pp. 1–26*).—In order to obtain more information on the calcium and phosphorus metabolism of dairy cows, the U. S. D. A. Bureau of Dairy Industry made a study of cows that have been kept for several years on rations containing different quantities of calcium. The calcium intake in the feed and the output in milk and calves were determined. At the end of the periods the cows were slaughtered and the bones and entire body analyzed for calcium and phosphorus content.

It was found that the percentages of calcium and phosphorus of the fat-free bodies of mature normal cattle were quite constant and that the calcium-phosphorus ratio, both in the whole body and bone, were highly constant. After several years on rations containing only about 25 g of calcium daily, the calcium content of the fat-free bodies was not likely to be reduced to less than 85 percent of the normal level. The change in the calcium-phosphorus ratio for the whole body as a result of such treatment was from 1.9 to about 1.8. Cows fed low-calcium rations for 9 mo. or more readily utilized about 50 percent of the calcium intake for the production of milk and calves. This conclusion was confirmed by the results of balance experiments. It is stated that there is every reason to believe that results of certain balance experiments which suggested that cows may store calcium and phosphorus in proportions entirely different from those usually found in the body were based on experimental error. It appeared from a study of other balance experiments that when the calcium content of a ration was reduced by substituting timothy hay or straw for alfalfa the vitamin A content was also likely to be reduced, and that the failures in reproduction were traceable to a vitamin A deficiency rather than to a calcium deficiency. The results suggest that for Jersey cows capable of giving 3,000 kg or more of milk annually an intake of 25 g of calcium daily was somewhat inadequate.

The phosphorus requirements of dairy heifers, J. G. Archibald and E. Bennett (*Jour. Agr. Res.* [*U. S.*], *51* (*1935*), *No. 1, pp. 83–96, figs. 4*).—Continuing this investigation (E. S. R., 65, p. 767) at the Massachusetts Experiment Station, two groups of four heifers each were fed as high-phosphorus and low-phosphorus groups. The basal ration consisted of a low-phosphorus mixed hay, dried beet pulp, and a grain mixture of corn meal, corn gluten meal, and blood flour 8:1:1. For the high-phosphorus group this ration was supplemented with rice bran. A total of 77 metabolism balance trials was carried out, 42 with the high-phosphorus lot and 35 with the low-phosphorus lot.

The results showed that the retention and utilization of nitrogen and calcium was quite similar in both groups except in the case of nitrogen storage by the 2-year-old groups, but this apparent difference may have been due to an insufficient amount of data. The retention of phosphorus by the high-phosphorus group was superior at all ages and significantly so during the first year. The low-phosphorus group was more efficient in the use of the phosphorus they received, but not to the extent of being equal to the high-phosphorus group in storage. The differences in growth and reproductive function of the two groups were very slight.

Heavy cottonseed meal feeding in relation to udder troubles in dairy cows, R. P. Hotis and T. E. Woodward (*U. S. Dept. Agr., Tech. Bul. 473* (*1935*), *pp. 16, figs. 4*).—In this investigation eight cows that had shown previous udder trouble were fed alfalfa hay for 22 weeks. In addition four of the cows were fed 10 lb. of cottonseed meal per day and the other four received from 5 to 10 lb. of a low-protein grain mixture. Weekly examinations of the milk were made for streptococci, chlorine content, and number of cells. These three tests were studied in conjunction with each other and with the strip-cup examination to obtain information regarding the normality or abnormality of the milk. In addition to these tests the udders were examined by palpitation every 2 to 4 weeks.

The results of the study show that the liberal feeding of a high-protein ration made up of cottonseed meal and alfalfa hay had little, if any, influence on the abnormality of the milk. This ration did not aggravate udder conditions as determined by physical examination of the udder and by laboratory examination of the milk. The high-protein ration did not force animals more or less subject to chronic attacks of mastitis into clinical cases.

Influence of season and advancing lactation on butterfat content of Jersey milk, R. B. Becker and P. T. D. Arnold (*Jour. Dairy Sci.*, *18* (*1935*), *No. 6, pp. 389–399, figs. 2*).—The Florida Experiment Station found that under the more uniform environment of the State the seasonal trend in fat percentage of the milk of Jersey cows varied almost inversely with the temperature. The lowest average butterfat tests usually occurred in August and the highest in December. The average test in the first month after calving was 4.605 percent, dropped to 4.594 percent in the second month, and then increased steadily to 5.555 for the twelfth month. Advancing lactation exerted a greater influence than did season on the fat test. Over a 16-yr. period it was found that an average increase of 10° F. between the monthly mean temperatures of 57° and 81° caused an average decrease of 0.81 percent in the butterfat test.

Production of quality milk and cream on the farm, T. M. Olson and C. C. Totman (*South Dakota Sta. Circ. 22* (*1935*), *pp. 20*).—The first part of this publication, by Olson, discusses how the various factors—barns and stables, flies, utensils, cooling, etc.—must be considered in the production of clean milk.

The second part, by Totman, points out that the cream producer must observe similar factors in the production of quality cream, discusses cream separation and grading, and outlines the sediment test.

Behavior of caseinate sols on a study of a hysteresis-like phenomenon in the rennet coagulation of heated milk, M. E. Powell and L. S. Palmer (*Jour. Dairy Sci., 18 (1935), No. 6, pp. 401–414, figs. 2*).—The Minnesota Experiment Station undertook this study to obtain evidence as to the analogous fraction in natural milk responsible for the different behavior of heated milks toward rennet.

Heated calcium caseinate-colloidal calcium phosphate "milks" as well as the mixtures of equal parts of the two separate sols exhibited hyteresis-like behavior when coagulated with rennet at definite intervals after heating. Heat treatment of calcium caseinate sols was practically without effect on their rate of coagulation either alone or when mixed with colloidal calcium phosphate. The same was true in the heat treatment of the colloidal calcium phosphate portion before adding the caseinate. The hysteresis effects of heat on the complex were due to the presence of both the caseinate and phosphate during heat treatment. A complex containing colloidal calcium oxalate showed no hysteresis due to heating. Colloidal calcium arsenate did not exist at the pH of natural milk. The fact that heating caused a greater increase in the velocity of migration of a caseinate-phosphate complex than a calcium caseinate sol showed that the effects of heat are greatest in the presence of the colloidal phosphates.

The vitamin A content of sour cream butter, sweet cream butter, and margarines, I. L. Hathaway and H. P. Davis (*Nebraska Sta. Res. Bul. 79 (1935), pp. 8, figs. 3*).—In order to determine the nutritive value of butter substitutes 19 samples of margarine were analyzed chemically and the vitamin A content compared with that of either sour-cream or sweet-cream butter. The fat content of the butter samples varied from 80.2 to 81.5 percent, while that of the margarine samples ranged from 78.3 to 89.2 percent.

When fed at the rate of 1 cc daily for 8 weeks as a source of vitamin A, one sample of margarine produced an average gain of 10 g per rat and another sample a gain of 25 g per rat. With all the other samples of margarine there was a final loss of weight, and most of the rats failed to survive the experimental period. The butter was fed at a rate equal to one-tenth or one-twentieth of the quantity of margarine fed in all but one case, and all the rats survived. The smallest gain on butter averaged 45 g per rat and the largest 111 g during the 8-week period.

The microbiology of butter, I, II (*Canad. Jour. Res., 12 (1935), No. 3, pp. 286–305*).—Two papers are presented.

I. *The yeast and mold count of butter as a measure of creamery sanitation*, F. W. Wood and H. R. Thornton (pp. 285–294).—In this paper from the University of Alberta, evidence is presented to show that yeast and mold counts of butter are not adequate as the sole measure of the microbial content of butter and of creamery sanitation. It is recommended that bacterial counts be used to supplement yeast and mold counts for these purposes.

II. *The growth of molds in and upon butter*, H. R. Thornton and F. W. Wood (pp. 295–305).—The improbability of the initiation of mold growth in the incorporated moisture of salted and unsalted butter and in the free moisture of salted butter is discussed. An attempt is made to relate the initiation of mold growth to condensation moisture on the various surfaces of butter.

Of four methods of treatment tested against subsequent mold growth, wet sterilization of the parchment was least satisfactory, while parchment in hot or cold saturated brine gave the maximum protection. *Cladosporium* sp. was isolated from a moldy patch in butter showing interior molding.

The hydrogen-ion concentration of creamery waters and their relationship to washing butter, N. S. Golding (*Jour. Dairy Sci., 18 (1935), No. 6, pp. 359–371, fig. 1*).—The object of this investigation at the Idaho Experiment Station was to determine the prevalence of alkaline water in the State and in eastern Washington and the effect of the reaction of such water on butter washed with it. The pH of creamery water supplies was determined by colorimetric methods.

With alkaline water the first wash water had a reaction between that of the water and cream, while the second wash water retained the reaction of the original water. Only slight changes were found in the reaction of the serum of the washed butter, and it was concluded that the changes in the reaction of the second wash water were largely a surface effect on the butter. Alkaline wash waters removed slightly more nitrogen from the butter in the grain than waters which had been acidified. After removing the extraneous buttermilk which affected the reaction of the first wash water, the evidence of dissolved protein in the alkaline wash water was more marked.

Some practical studies in the cold storage of butter, L. C. Thomsen (*Natl. Butter and Cheese Jour., 26 (1935), No. 15, pp. 30–32*).—The object of this study at the Wisconsin Experiment Station was to determine the effect of the color and type of wrapping material on the flavor of butter.

When stored in a dark refrigerator none of the wrappers gave a true oxidized flavor to butter. A slight oiliness occurred in one or two samples, particularly when air was permitted to pass to the butter. In samples exposed to light, oxidized flavor did not develop when aluminum foil and dark green nonwaterproof cellulose wrappers were used, but with the latter a briny surface flavor was noticeable. With such wrappers as cellulose with light filtering MRT on the outside and parchment wrapped in carton, a slight oxidized flavor occurred. The oxidized flavor was definitely noticeable after 1 week with dark blue nonwaterproof cellulose, and after 3 days with dark red nonwaterproof cellulose, Kerr glass jar, waterproof cellulose, Tango nonwaterproof cellulose, and rubber film, while with pink nonwaterproof cellulose and parchment the flavor was very objectionable after 3 days.

Improving the quality of Oklahoma butter, E. L. Fouts and J. I. Keith (*Oklahoma Sta. Bul. 226 (1935), pp. 31, figs. 14*).—This bulletin presents the results of 2.5 years' service to the butter manufacturing plants of the State, in which aid was given by analyses of over 3,000 samples in standardizing the composition and improving the quality of Oklahoma butter.

Other portions of the bulletin are devoted to discussions of and instructions in neutralizing high acid cream for butter making, methods and equipment for the propagation of starters, cooling cream on the farm and in cream buying stations, and testing for sediment in cream.

Results of experimental trials indicated that when high-acid cream (0.6 percent or above) is to be used for buttermaking purposes, it is desirable to double neutralize, using a magnesium lime and sodium carbonate. Neutralizing two-thirds of the excess acid with magnesium lime and one-third with sodium carbonate proved satisfactory. Other proportions of lime and soda also were found to yield satisfactory results. Calcium or magnesium limes alone often caused noticeable neutralizer flavor in the resulting butter. Sodium bicarbonate, when used with either calcium or magnesium limes, frequently imparted a bicarbonate flavor to the resulting butter. It has also been found desirable, particularly if the acid is 0.8 percent or over, to add the lime mix in several installments to decrease the severity of the reaction.

Results of similar experiments using cream of medium and low acidities indicated that cream with an acid content between 0.4 and 0.6 percent may be satisfactorily neutralized by a single application of magnesium or calcium lime. The magnesium again showed a slight advantage over the calcium lime. For cream with an acid content below 0.4 percent treatment with either of the limes or sodas studied proved satisfactory, with some advantage indicated for magnesium limes and sodium carbonate.

The bacteriology of Swiss cheese, II, III (*Jour. Dairy Sci., 18* (*1935*), *Nos. 6, pp. 373–387, figs. 4; 8, pp. 503–510, fig. 1*).—These papers continue this investigation (E. S. R., 72, p. 686) by the U. S. D. A. Bureau of Dairy Industry.

II. *Bacteriology of the cheese in the press*, W. C. Frazier, L. A. Burkey, A. J. Boyer, G. P. Sanders, and K. J. Matheson.—A study was made of the bacterial content of cheese from the time the curd was dipped until the cheese had been in the press for 21 hr.

It was found that *Streptococcus thermophilus* usually started to grow within 3 to 4 hr. after dipping, increased rapidly to the sixth or eighth hour, after which increase was slow, and in some cases the numbers decreased gradually to the twenty-first hour. *Lactobacillus helveticus* (39a) decreased slowly until the sixth to eighth hour in the press, then increased at a fairly rapid rate, with the numbers high after 21 hr. with an active starter and low with a weak starter. *L. bulgaricus* (Ga) usually decreased in numbers until the fifth hour after dipping and then increased rapidly.

The pH of the cheese dropped more rapidly during the first 7 or 8 hr. than during later periods, due chiefly to the action of the *S. thermophilus* organisms. Most of the cells of this organism had a diameter 3 or 4 times and a volume approximately 27 or 64 times as great as that of cells grown at ordinary temperatures. This condition was one explanation for the large fermentative activity during the early hours in the press. Small amounts of acid produced relatively large changes in pH at this time, due to the relatively small buffer value in the early pH range. The relative change in pH at 3 and at 21 hr. after dipping served as an indication of the effectiveness of the *S. thermophilus* and lactobacillus starters, respectively.

The action of *S. thermophilus* was practically the same in large and small cheeses, but the growth and action of lactobacillus cultures began an hour or two later in large cheeses, due to the interiors of such cheeses cooling more slowly. Gas formation and growth of either *Escherichia communior* or *Aerobacter aerogenes* should be suppressed in the press by the use of active starters, but if the latter organisms were present in the kettle in large numbers a poor quality cheese was usually produced. *Propionibacterium shermanii* did not grow in the press, but bacteria of the tetracoccus or *L. casei* types usually increased in numbers if present and under some conditions became quite numerous by the twenty-first hour. *Clostridium lactis* died off rapidly in the press, while *L. lactis* and *L. longus* types were able to grow rapidly but were usually not present in large numbers.

III. *The relation of acidity of starters and of pH of the interior of Swiss cheeses to quality of cheeses*, W. C. Frazier, W. T. Johnson, Jr., F. R. Evans, and G. A. Ramsdell.—A study was made of Swiss cheese manufactured under factory conditions to determine what acidity of pure culture starters and what rate of lactic acid fermentation in cheese in the press were most desirable.

With the milk used a *Lactobacillus helveticus* milk starter with an acidity of 1 to 1.09 was most effective. The starter was grown at 37.5° to 39° C.

for 12 hr. A milk starter of *Streptococcus themophilus* grown for 12 hr. at 37° should have an acidity of about 0.7 to 0.75 percent, and a whey starter should have an acidity of 0.3 to 0.33 percent. The pH of the cheese in the press should be about 6 to 6.09 after 3 hr. in cheese made from milk with a pH of 6.5 to 6.6. After 21 hr. in the press the pH of the cheese should be less than 5.2 and preferably between 5.15 and 5. With good milk a slow development of acidity throughout the first 21 hr. usually resulted in good cheese. The pH of such cheese may be as high as 6.1 to 6.25 after 3 hr. in the press and over 5.2 after 21 hr. With good milk and manufacturing methods, the proper preparation and use of pure culture starters will give Swiss cheese of good average quality.

The storage of packaged ice cream, R. W. Smith, Jr. (*Vermont Sta. Bul. 394 (1935), pp. 14*).—This study was undertaken to determine the effect of storage on changes in weight, volume, body and texture, and flavor of packaged ice cream. Samples of vanilla, strawberry, chocolate, and maple walnut ice cream in quart and pint packages were stored at from —6° to —20° F. for from 16 to 24 weeks and judged from time to time.

The weight, volume, and body and texture were not altered by storage. A surface film developed in unlined packages in from 3 to 4 months' time, but this defect did not occur in lined packages or with the chocolate cream. The flavor of strawberry began to deteriorate in from 1 to 2 mo., and in vanilla in about 3 mo. On the other hand, chocolate and maple walnut flavors remained unchanged at the end of 4 mo. The age of the ingredients at the time of manufacture determined the true age of ice cream more than the length of time after which it was frozen, and for successful storage ice cream must be good at the beginning of the storage period.

VETERINARY MEDICINE

The physiology of domestic animals, H. H. Dukes (*Ithaca, N. Y.: Comstock Pub. Co., 1935, 3. ed., rev., pp. XIV+643, figs. 169*).—This is a printed edition of the work previously lithoprinted (E. S. R., 70, p. 674). The work has been thoroughly revised, E. A. Hewitt and G. W. McNutt collaborating in the revision. The foreword is by H. D. Bergman.

A guide to the study of special veterinary pathology, R. A. Runnells (*Ames, Iowa: Collegiate Press, 1935, pp. XIII+218*).—Following a brief preface and an introduction by E. A. Benbrook, part 1 (pp. 1–119) of this guide deals with systematic pathology in 7 chapters and part 2 (pp. 123–202) with special pathology of the specific infectious diseases in 21 chapters. References to deficiency diseases, plant poisonings, disturbances of metabolism, and text and reference books are appended. References to the literature accompany each chapter.

[Contributions from the U. S. D. A. Bureau of Animal Industry] (*U. S. Dept. Agr. Yearbook 1935, pp. 122, 123, 233–236, 247–249, 258, 259, 319–321, figs. 4*).—Practical contributions presented include the following: Anthrax Control Has Been Aided by Results of Recent Experiments, by W. S. Gochenour (pp. 122, 123) (E. S. R., 73, p. 679); Horse Disease, Known as Encephalomyelitis, Yielding to Research, by L. T. Giltner and M. S. Shahan (pp. 233–236); Livestock Poisoned with Hydrocyanic Acid Can Be Saved by Prompt Treatment, by A. B. Clawson, H. Bunyea, and J. F. Couch (pp. 247–249) (E. S. R., 73, p. 548); Mastitis of Cattle May Be Controlled by Tests and Sanitary Procedures, by W. T. Miller (pp. 258, 259); and Tuberculin of Greater Purity and Efficiency Developed by Department, by M. Dorset (pp. 319–321).

[Report of work in animal pathology and parasitology by the Idaho Station] (*Idaho Sta. Bul. 217 (1935), pp. 18–21, 36–38, fig. 1*).—The report refers to the work of the year (E. S. R., 72, p. 102) with the sheep botfly, its biology, prevention, and control; infectious bovine abortion and its control; pullorum disease and its control; the cause and control of foul sheath in rams; infectious mastitis of dairy cattle; and factors influencing the spread of fowl paralysis.

Veterinary medicine (*Minnesota Sta. Bul. 319 (1935), pp. 63–67*).—This brief account of the work of the division of veterinary medicine since its establishment in 1888 refers to the control of tuberculosis, Bang's disease, sterility, algal poisoning, Sudan grass findings, ventilation, and diseases of swine and of poultry.

[Report of work in animal pathology by the North Carolina Station] (*North Carolina Sta. Rpt. 1933, pp. 55, 56, 57–60*).—The work of the year briefly referred to (E. S. R., 70, p. 825) includes bovine infectious abortion (Bang's disease), by W. Moore, L. J. Faulhaber, and C. D. Grinnells; septicemic diseases among fowls in the State, by R. S. Dearstyne and R. E. Greaves; pathological hematology of the fowl, by F. W. Cook and Dearstyne; and pathological hematology of the fowl—pullorum disease, the details of which are given in tabular form, by Cook, Dearstyne, and J. E. Kelly.

[Contributions on animal pathology] (*Ontario Vet. Col. Rpts., 1931, pp. 13–29, 29–56, 58–71, figs. 12; 1932, pp. 13–30, 31–50, 55–59, figs. 11; 1933, pp. 20–63, 66, 67, figs. 11; 1934, pp. 20–69, figs. 31*).—The contributions presented in the report for the year 1931 include the following: Report of the Committee Making a Survey on Mineral Deficiency Diseases in Cattle (pp. 13–25) and Nephrolithiasis in Cattle (pp. 25–29), both by R. A. McIntosh; Report on a Disease of Goats Characterized by Cholecystitis and Infection with *Salmonella schottmuelleri* (pp. 29–39) and Report of the Experimental Work on Hypertrophic Cirrhosis of the Liver of the Horse (pp. 40, 41), both by F. W. Schofield; Hypertrophic Cirrhosis of the Liver of the Horse Occurring as an Endemic Disease in Lambton County (pp. 41–43); Report on a Disease Resembling Swamp Fever as It Has Been Observed in Different Localities in Ontario (pp. 43–49); Heavy Mortality among Ducklings Due to *Hymenolepis coronula* (p. 49), Notes on the Effect of the Immunization of Cattle with Haemorrhagic Septicaemia Bacterins on the Agglutination Titre of *Brucella abortus* (pp. 49, 50), and Anaemia in Suckling Pigs (pp. 50, 51), all by F. W. Schofield; Milk Hygiene, Poultry Diseases, and Serology (pp. 51–53), A Review of the Routine Work in Connection with Poultry Diseases during the Past Year (pp. 53–55), and Mercurial Poisoning in Fowl (p. 56), all by J. S. Glover; The Control of Infections of *B[acillus] bronchisepticus* in Dogs, by H. E. Batt (pp. 58–60); and Work of the Department of Parasitology, by A. A. Kingscote (pp. 60–71).

Contributions presented in the 1932 report include the following: Report of the Committee Making a Survey of Mineral Deficiency Disease in Cattle for the Year 1932 (pp. 13–24), The Report of an Investigation of an Outbreak of Disease in Cattle at Harrow, Ontario (pp. 25–27), Magnesium Sulphate Poisoning (pp. 27, 28), and An Unusual Case of Valvular Lesions in a Jersey Cow (pp. 28–30), all by R. A. McIntosh; Enzootic Hypertrophic Cirrhosis of the Horse Caused by the Feeding of Alsike Clover (pp. 31–41) and Report of the Feeding Experiments with Alsike Clover Conducted at New Liskeard, 1932 (pp. 42–50), both by F. W. Schofield; Milk Hygiene, Poultry Diseases, and Serology, by J. S. Glover (pp. 55, 56); and Work of the Department of Parasitology, by A. A. Kingscote (pp. 57–59).

The contributions included in the 1933 report are as follows: Report of the Committee Making a Survey of Mineral Deficiency Disease in Cattle for the Year 1933 (pp. 20–24), Johne's Disease of Cattle (pp. 24–27), and Congenital

Deformity in a Calf (pp. 28, 29), all by R. A. McIntosh; Coccidiosis in Mink, by A. A. Kingscote (pp. 30–41); Bovine Hemoglobinuria Associated with an Intestinal Infection Caused by the *Cl[ostridium] welchii* (pp. 42–61) and Brief Report of an Epidemic of Infectious Diarrhoea in Cattle (pp. 62, 63), both by F. W. Schofield; and Unusual Cases Encountered in Fowl during the Past Year, by J. S. Glover (pp. 66, 67).

The contributions presented in the 1934 report are as follows: Report of an Outbreak of Malignant Catarrh (pp. 20–22), Convulsions in Suckling Calves (pp. 22, 23), and Report of a Serious Outbreak among Swine Due to the *S[almonella] suipestifer* (pp. 23, 24), all by F. W. Schofield; Swine Erysipelas, by R. A. McIntosh (pp. 24–28); The Normal Histology of the Endocrin Glands of *Gallus domesticus*, by H. E. Batt (pp. 29–48); and Preliminary Report upon the Use of Azamine (Tolylazodiamino-pyridine-hydrochloride) for the Treatment of Coccidiosis (pp. 49, 50) and Myiasis in Man and Animals Due to Infection with the Larvae of *Wohlfahrtia vigil* (Walker) (pp. 51–69), both by A. A. Kingscote.

Allergy: A review of current literature, F. M. Rackemann (*Arch. Int. Med., 55 (1935), No. 1, pp. 141–167*).—This review is presented with a list of 31 references to the literature.

Methods used in the preparation of a new type of dead anti-abortion vaccine: Bovine uterine fluid as an enrichment medium, W. R. Kerr, H. G. Lamont, and P. L. Shanks (*Vet. Jour., 91 (1935), No. 7, pp. 306–308*).—The experiment reported, though limited in nature, suggests that bovine uterine fluid possesses enrichment properties which may be of use in the cultivation of certain organisms.

On the isoelectric zones of Eberthella typhosa and Brucella abortus agglutinins, S. R. Damon and A. A. Hajna (*Amer. Jour. Hyg., 22 (1935), No. 2, pp. 392–397, fig. 1*).—The authors have found that "the isoelectric zone of *B. abortus* agglutinin in bovine serum is between pH 5.57 and 5.65. The turning point of *B. abortus* agglutinin in bovine serum is very close to pH 5.60."

An outbreak of foot and mouth disease in elephants, B. Ramiah (*Indian Vet. Jour., 12 (1935), No. 1, pp. 28, 29*).—The occurrence of foot-and-mouth disease in two elephants, in which a period of 6 to 8 weeks was required for recovery, is reported.

Enzootic psittacosis amongst wild Australian parrots, F. M. Burnet (*Jour. Hyg. [London], 35 (1935), No. 3, pp. 412–420*).—The author found that "psittacosis infection is enzootic amongst several of the common species of Australian parrots in the wild state. A large proportion of recently caught individuals of *Psephotus haematonotus*, *Trichoglossus* (two species), and *Leptolophus hollandicus* are infected. In other genera, demonstrable infection is rare, but enlarged noninfective spleens probably indicative of past infection are common.

"The virus strains derived from wild Australian parrots appear to resemble closely those isolated from human and parrot infections in Europe and America."

A new species of tick which is a vector of relapsing fever in California, C. M. Wheeler (*Amer. Jour. Trop. Med., 15 (1935), No. 4, pp. 435–438*).—Under the name *Ornithodorus hermsi* the author describes a new species taken at Big Bear Lake, San Bernardino County, Calif. It is concluded from the evidence presented in a previous paper (E. S. R., 73, p. 847) that this tick transmits relapsing fever.

Examination of some new Salmonella types [trans. title], F. Kauffmann and W. Silberstein (*Zentbl. Bakt. [etc.], 1. Abt., Orig., 132 (1934), No. 7–8, pp. 431–437; abs. in Bul. Hyg., 10 (1935), No. 2, pp. 124, 125*).—A report is made of an examination of the more recently described species of *Salmonella* with regard to their place in the Kauffmann-White scheme of antigenic structure (E. S. R., 72, p. 534). Among those studied was *S. anatum*, isolated from human cases of gastroenteritis. Two other members of the group are said to be pathogenic for both ducks and human beings, namely, *S. typhimurium* (*aertrycke*) and *S. enteritidis*.

Typing of Gärtner bacilli and their source in the animal world [trans. title], J. Hohn and W. Herrmann (*Zentbl. Bakt.* [*etc.*], *1. Abt., Orig., 133* (*1935*), *No. 3–4, pp. 183–196; abs. in Bul. Hyg., 10* (*1935*), *No. 5, pp. 346, 347*).—The authors report upon the collection of 97 strains of *Salmonella enteritidis* and its variants which they have differentiated according to cultural, biochemical, and serological characters. The importance of such differentiation lies in establishing the possible sources of infection in human food poisoning. The authors are unable to arrive at any probable source for *S. enteritidis jena*, but the *ratin* variety appears to be specific for rodents such as rats; the *dublin* (Kiel) and *rostock* types for cattle, especially calves, but they have also been associated with swine and foals. The *moscow* variety is stated to be commonly found in birds, particularly ducks and duck eggs.

There are extensive references to the association of Gärtner bacilli and animal diseases.

A study of the hemolytic action of Salmonella pullorum and S. gallinarum [trans. title], A. Urbain and G. Guillot (*Compt. Rend. Soc. Biol.* [*Paris*], *119* (*1935*) *No. 27, pp. 1263, 1264*).—The authors found *S. pullorum* and *S. gallinarum* to possess a very light hemolytic action on the red blood cells of the guinea pig but to be without such action on the blood of the horse, sheep, rabbit, and fowl.

Experiments concerning nasal infection with B. suipestifer, Gaertner-bacillus (rat type), and B. enteritidis Breslau and experimental epidemiology with animals infected by nasal cavity, J. Takita (*Kitasato Arch. Expt. Med* [*Tokyo*], *12* (*1935*), *No. 3, pp. 265–277, figs. 5*).—Two strains of *Salmonella suipestifer* and four strains of Gaertner bacillus (rat type) were used in the experiments conducted on German mice, rabbits, and rats.

"The lethal dose of the intestinal pathogenic organisms for either mice or rabbits determined by the nasal inoculation is smaller than that by the oral inoculation. This lethal dose varies according to individual strains even in the same group of organisms. When a large dose of the organisms was given per os the organisms remained in the nasal cavity for a longer time than in any other part of the digestive tract. In the case of nasal inoculation the organism is especially abundantly recovered from nasal cavity and is also found present for long time in digestive tract. After the latter method of inoculation, abundant organisms are found also in the intestinal tract for a long time and the infection is more certain than after the oral inoculation. The organisms are found in the intestinal tract for a long time in case of the nasal inoculation, but the infection was never communicated to normal exposed animals. This finding, however, is not applicable to the natural epidemic, where it takes place under very complicated conditions."

Differentiation of Str[eptococcus] pyogenes from man and animals by the sorbitol-trehalose test, F. C. Minett (*Jour. Path. and Bact., 40* (*1935*), *No. 2, pp. 357–364*).—"Examination of a series of *S. pyogenes* strains from man and from cow's milk has given support to the view that streptococci of this kind from man are trehalose fermenters, while those which may be found in cow's milk are ordinarily sorbitol fermenters. Considered in conjunction with the work of previous observers, the sorbitol-trehalose test thus appears to be a simple method of considerable value in establishing the original source of streptococci of this kind when present in milk.

"Apart from *S. equi*, 10 strains out of 12 isolated from equines fermented sorbitol and not trehalose. Judged by a methylene blue reduction test, however, the 2 remaining strains were probably of animal type. Eleven of the 12 strains from dogs, cats, and ferrets fermented neither sorbitol nor trehalose but differed from *S. equi* in fermenting lactose.

"Attention is again called to a group of streptococci, found in milk, which ferment both trehalose and sorbitol. These streptococci, however, although actively hemolytic and failing to split sodium hippurate, should be excluded from the *S. pyogenes* group."

Further observations on the relation of certain carbohydrates to Trypanosoma equiperdum metabolism, H. A. Poindexter (*Jour. Parasitol., 21 (1935), No. 4, pp. 292–301*).—In further observations (E. S. R., 70, p. 678) it was found that "fermentable carbohydrates seem to play a very important part in the rate of multiplication, survival time, and virulence of trypanosomes. The decrease in the blood sugar by insulin injection decreases the rate of multiplication of trypanosomes, as shown by examination of blood taken from peripheral circulation. Infected animals injected with insulin survived longer than similarly infected animals without insulin. There was a decrease in the dose of insulin required to produce a shock as the course of the infection progressed. This corresponded with the decrease in the amount of available fermentable carbohydrate in the blood and to the liver damage."

The effect of a caustic hypochlorite on the tubercle bacillus as an index of the efficiency of chemical sterilization of dairy utensils, J. W. Rice (*Penn. Assoc. Dairy and Milk Insp. Ann. Rpt., 10 (1934), pp. 40–46*).—The author has found that the caustic hypochlorite antiformin kills tubercle bacilli in a contact time of 10 min. if employed undiluted in a relationship of 1 to 5 parts of tuberculous sputum, but that it does not provide a sufficiently large margin of safety for this time and concentration. "Antiformin in a final concentration of 16⅔ percent in a solution of tuberculous sputum apparently destroys the tubercle bacillus by dewaxing the organisms, indicated by the loss of its acidfast properties, and later by dissolving the organism itself, as evidenced by appreciably smaller numbers in direct cell counts of suspensions as the contact interval is increased. In a final concentration of 5 percent, antiformin seems to exert no germicidal action at all on tubercle bacilli up to and including 8 hr. of contact.

"Undiluted antiformin is impracticable as a chemical sterilizer of dairy utensils in that the cost would prohibit its use in this form, and it is too corrosive to tissues to allow any hand manipulation in great concentration."

Tularemia: A consideration of one hundred and twenty-three cases, with observations at autopsy in one, C. N. Kavanaugh (*Arch. Int. Med., 55 (1935), No. 1, pp. 61–85, figs. 13*).—This contribution is presented with a list of 88 references to the literature. In considering the etiology of the disease, it is stated that its incidence in Kentucky is almost entirely controlled by epizootics in cottontail rabbits, which occur cyclically, at irregular intervals, and under conditions as yet imperfectly known.

Selenium occurrence in certain soils in the United States, with a discussion of related topics, H. G. Byers (*U. S. Dept. Agr., Tech. Bul. 482 (1935), pp. 48, figs. 4*).—Following a brief introduction in which the history of work with selenium is considered, the results of a preliminary survey, the finding of selenium in Pierre shales, the results of an examination of water samples, and the finding of pyrites as the source of selenium are reported upon. The results of investigations in 1934 are reported upon at some length (pp. 11–35), followed by an account of the Belle Fourche irrigation area of South Dakota (pp. 35–40).

The work has shown the source of selenium in soils to be sulfide minerals occurring in the soil parent materials. "So far as yet known the seleniferous soil-forming material is, for the most part, shales of the Cretaceous period. Soils derived from these shales, or from other seleniferous materials, may retain sufficient selenium to produce toxic vegetation when the mean annual rainfall is insufficient to produce percolation through the soil profile.

"The distribution of the selenium is not uniform in any area examined, either in the surface soils or in the soil profile. There are indications of a zone of selenium concentration in the soil profile, either within or close to the zone of sulfate accumulation. The limits of no single area are accurately known, but there is evidence warranting the belief that the effective distribution coincides with the distribution of certain soil series.

"The amount of selenium absorbed from seleniferous soils by plants is apparently dependent on (1) the quantity of selenium and its distribution in the soil profile; (2) the kind of plant; (3) the portion of the plant examined; and (4) the soil composition, especially its available sulfur content. It is also believed that variation will also result from seasonal variation in rainfall.

"On the basis of available data, both published and unpublished, the writer ventures the following considered suggestions: Any action based upon the existing conditions should be carefully thought out. The areas of toxic arable land so far examined are close to or within areas otherwise submarginal, and it would seem wise to withdraw such seleniferous lands from cereal production, by purchase or otherwise. Grazing lands may safely be left to the discretion of the owners, as in the past. Irrigation areas should be carefully examined and controlled as conditions warrant. The study of toxic limits, tolerance limits, diagnostic symptoms, and remedial measures should be undertaken.

"Tolerance limits should be set up as soon as possible, but the emergency, as shown by available data, is not serious enough to warrant hasty measures. Methods of analysis should be studied carefully to secure accurate control work at lessened cost. The exact extent of affected areas should be determined and remedial measures applicable to field conditions should be sought. Above all, the proper safeguarding of public health within the areas affected should be studied."

The toxicity of sodium cyanide and the efficiency of the nitrite-thiosulphate combination as a remedy for poisoned animals, A. B. Clawson, J. F. Couch, and H. Bunyea (*Jour. Wash. Acad. Sci., 25 (1935), No. 8, pp. 357–361*).—In continuation of their studies (E. S. R., 73, p. 543), the authors have found that "when given to sheep as a drench in water solution, 4.15 mg of sodium cyanide per kilogram of animal weight produced symptoms of poisoning and 5.22 mg or more killed, and these quantities are considered to be the approximate minimum toxic and minimum lethal doses, respectively. Basing the doses on the CN content, sodium cyanide is somewhat less toxic than potassium cyanide or hydrocyanic acid. Following the administration of sodium cyanide, the average time to the appearance of symptoms is approximately 1 min., to collapse 3 min., and to death 34.5 min. Taking into account the probability of experimental error, these respective periods are about the same as for poisoning by potassium cyanide or by hydrocyanic acid. The nitrite-thiosulfate combination was effective in 57 percent of the cases in which it was tried."

White snakeroot poisoning, R. Graham and V. M. Michael (*Illinois Sta. Circ. 436 (1935), pp. 12, pl. 1, figs. 5*).—A practical summary of information on this affection of cattle, sheep, horses, and hogs.

The Nation-wide campaign to control Bang's disease, A. E. Wight (*Jour. Amer. Vet. Med. Assoc., 87 (1935), No. 3, pp. 291–295*).—A brief report on the progress of control work with Bang's disease conducted under the Jones-Connally Cattle Act, which became effective July 19, 1934.

The diagnosis and control of Bang's disease in Friesland, A. H. Veenbaas (*Diagnostiek en bestrijding van de abortus Bang in Friesland. Proefschr., Rijks-Univ., Utrecht, 1935, pp.* [*8*]+*150*+[*4*], *pls. 2, figs. 4; Eng. abs., pp.* [*4*]).—The first part of this work deals with the nature of Bang's disease and its diagnosis (pp. 1–61), the second part with its control (pp. 62–126). The contribution is accompanied by a 5-page list of references to the literature.

Parasitic dermatorrhagia in North African bovines due to Setaria haemorrhagica [trans. title], L. Faure (*Ann. Parasitol. Humaine et Compar., 13 (1935), No. 2, pp. 113–115*).—The author has found that *S. haemorrhagica* can produce a hemorrhagic filariasis of equines analogous to that in bovines and essentially seasonal in occurrence.

Studies on rinderpest susceptibility of cattle, J. D'Costo (*Indian Vet. Jour., 12 (1935), No. 1, pp. 2–7*).—The author's studies show that the degree of susceptibility to rinderpest may vary to a large extent not only in different breeds but also in the animals of the same breed under certain conditions, and that this is of great importance and should receive serious consideration by those engaged in rinderpest inoculations.

The identity of the Anaplasma of sheep in France and Algeria [trans. title], J. Cuillé, Chelle, and Berlureau (*Compt. Rend. Acad. Sci.* [*Paris*], *201 (1935), No. 2, pp. 179, 180*).—Continuing their studies (E. S. R., 73, p. 848), the authors have found through cross-inoculation that the *Anaplasma* parasites of sheep in Algeria and in France are the same. Sheep recovered from anaplasmosis in France were found to be premunized against the virus of the Algerian disease.

"Strike" of sheep in North Wales, R. F. Montgomerie (*Vet. Jour., 91 (1935), No. 8, pp. 350–356*).—The author finds that strike of adult sheep in North Wales is a disease characterized by sudden death and having a seasonal incidence closely associated with periods of quick growth of grass in spring. "Bacteriological examination of the carcasses of very recently dead sheep has given negative results. A toxin was demonstrated in the contents of the small intestine of 17 of 19 cases of the disease. Each of the eight filtrates, obtained after antisera prepared against *B*[*acillus*] *ovitoxicus* and *B. welchii* (Wilsdon, type D) were available, was shown to contain toxin of the *B. ovitoxicus* type. *B. ovitoxicus* (*B. welchii* Wilsdon, type D) was apparently the only organism of the Welch group present in the intestinal contents of the 3 cases studied in detail.

"It is concluded that 'strike' of adult sheep in North Wales is an infectious enterotoxemia of the same nature as the braxylike disease investigated by Bennetts in Western Australia [E. S. R., 67, p. 600]."

A treatment for lamb dysentery or scours, J. N. Shaw (*Natl. Wool Grower, 25 (1935), No. 6, pp. 22, 23*).—In work at the Oregon Experiment Station, fermented milk made from a culture of *Lactobacillus acidophilus* kept in the department for a 3-mo. period with transfers made every 2 weeks was successful in both treating and preventing lamb dysentery or scours as it affects lambs in Oregon. The treatment was undertaken following severe losses of lambs in the first few days, and usually within 48 hr. of life, that had occurred for many years in several counties of eastern Oregon.

Brucellosis in swine (Traum's disease or infectious abortion), R. Graham and V. M. Michael (*Illinois Sta. Circ. 435 (1935), pp. 12, figs. 6*).—A revision of Circular 271, previously noted (E. S. R., 49, p. 787).

Infectious anemia or swamp fever in horses: A review of the Bureau of Animal Industry's investigations, C. D. Stein (*Jour. Amer. Vet. Med. Assoc., 87 (1935), No. 3, pp. 312–324*).—This review is presented with a list of 9 references to the literature.

The present status of research and control of stomach and intestinal parasites of the horse [trans. title], Seehawer (*Ztschr. Veterinärk., 47 (1935), No. 8, pp. 257–273*).—This contribution is presented with a list of 41 references to the literature.

Parasites and parasitic diseases of horses in Puerto Rico, H. L. Van Volkenberg (*Puerto Rico Sta. Bul. 37 (1935), pp. 19, figs. 3*).—Following a brief introduction, this contribution on parasites and parasitic diseases of equines, including the horse, mule, ass, and burro, deals with the general characteristics and effects of parasites and general control measures. The internal parasites, particularly the large stomach worms, large strongyles, small strongyles, and perfoliate tapeworm, and the external parasites, particularly the tropical horse tick, psoroptic mange (sarna or piojillo), sarcoptic mange, and biting or bloodsucking flies, are dealt with at some length.

Control of rabies in New York City, R. Olesen (*Pub. Health Rpts. [U. S.], 50 (1935), No. 33, pp. 1087–1106, figs. 3*).—The author considers the evidence available to indicate strongly that vaccination against rabies in dogs is in the experimental stage and that reliance should not at present be placed upon this measure.

Diseases and parasites of poultry, E. H. Barger and L. E. Card (*Philadelphia: Lea & Febiger, 1935, pp. 354, pl. 1, figs. 73*).—The several chapters of this work deal with the subject as follows: The mortality problem, the nature of disease, the anatomy of the fowl, poultry surgery, diagnostic methods, bacterial diseases, virus disease, protozoan diseases, nutritional disorders, miscellaneous conditions, poisons, internal parasites, external parasites, and controlling flock mortality. Additional information is presented in an appendix, and author and subject indexes are included. The foreword is by L. Van Es.

A preliminary study of the reaction of two disease resistant stocks of chickens after infection with their reciprocal pathogens, W. V. Lambert (*Iowa Acad. Sci. Proc., 40 (1933), pp. 231–234, fig. 1*).—The results of work with *Salmonella pullorum* and *S. gallinarum* indicate that selection for resistance to one pathogen affords some protection to infection with a closely related one.

The diseases of poultry spread by soil contamination, P. W. Allen, M. Jacob, and T. A. Magill (*Poultry Sci., 14 (1935), No. 5, pp. 313, 314*).—Brief reference is made to work carried on in continuation of that previously noted (E. S. R., 64, p. 382), in which it was found that sodium acid sulfate applied to poultry yard soil at the rate of 1 gal. of a 5 percent solution to 1 sq. ft. of pulverized soil is a cheap and efficient method of destroying *Salmonella pullorum*, *Bacillus avisepticus*, *Eimeria tenella*, and *Entamoeba meleagridis*.

The experiments are said to have shown that "Italian ryegrass grows as well on treated soil plats, 5 mo. after soil is disinfected, as on control plats. Poultry kept on disinfected soil show no signs of burned feet or of disturbed digestion resulting from obtaining food from disinfected soil. Not all of the improvement in weight and condition shown by poultry kept on disinfected soil over those on nondisinfected soil can be attributed to the destruction of disease-producing microbes of the soil by the disinfectant."

The influence of vermifuge treatment of laying hens under field conditions, W. L. Blaecker and R. M. Smith (*Poultry Sci., 14 (1935), No. 5, p. 313*).—Reporting upon vermifuge treatment of laying hens (E. S. R., 72, p. 845), it is stated that the efficiency of eight commercial preparations tested varied from 78.5 percent to as low as 44.4 percent. Treatments for roundworms seemed to be more advisable than treatment for tapeworms, whether the treated birds were confined or allowed range. The treatments had no consistent influence upon the number of internal parasites harbored by the treated birds 90 days after the last vermifuge treatment.

It is concluded that the former recommendations, namely, that all young birds be treated individually for tapeworms and roundworms at a date 2 or 3 weeks before they are transferred from the range to the laying house and repeated at the time the pullets are placed in the laying house, should be continued.

The northern fowl mite and its control, W. A. Maw, W. E. Whitehead, and L. H. Bemont (*Poultry Sci., 14 (1935), No. 5, p. 313*).—Brief mention is made of the northern fowl mite *Liponyssus sylviarum* C. & F., a satisfactory method of control of which on the body of the fowl consists in the use of a mixture of naphthalene flakes 1 part to 2 parts of vaseline by direct application of the ointment to the body or when placed on the roosts in the house.

Some micro-organisms complicating the course of laryngotracheitis and coryza, C. S. Gibbs (*Poultry Sci., 14 (1935), No. 5, p. 314*).—The author has found *Streptococcus bronchitis*, *Staphylococcus gallinarum* n. sp., *Micrococcus gallinarum* n. sp., and *Hemophilus gallinarum* complicating laryngotracheitis and coryza. "*S. bronchitis* is responsible for the symptoms and lesions of bronchitis and bronchopneumonia; *S. gallinarum* n. sp. and *M. gallinarum* n. sp. for sore eyes, swelling of the infraorbital sinuses, swollen wattles, and a general systemic malaise. *H. gallinarum* is responsible for rhinosinusitis and swollen heads. The symptoms and lesions of uncomplicated laryngotracheitis are confined to the larynges and tracheas, and coryza to the eyes, nostrils, and trachea. The mortality from laryngotracheitis is considerably increased when complicated by one or more of these micro-organisms. Coryza is never serious unless it is primary or secondary to one or more of these diseases."

Coccidiosis in bovines and poultry, H. G. Lamont (*Vet. Rec., 15 (1935), No. 34, pp. 1028–1044*).—This contribution, presented with a list of 50 references to the literature, includes a table of the characters used for the separation of the six species of *Eimeria* occurring in chickens, namely, *E. tenella*, *E. mitis*, *E. acervulina*, *E. maxima*, *E. necatrix*, and *E. praecox*.

The effects of certain acid treatments for coccidiosis on the H ion content of the fowl's intestine, W. R. Kerr and R. H. Common (*Vet. Jour., 91 (1935), No. 7, pp. 309–311*).—The authors consider the evidence that the various "acid treatments" for avian coccidiosis are beneficial to be open to doubt. "The work now reported indicates that the feeding of these 'acid' agents to fowls according to the recommendations for treatment of coccidiosis does not render the intestinal contents more acid than normal. Therefore if these agents are of benefit, the explanation must be sought elsewhere, and the suggestion is made that in the case of milk preparations the good results claimed may in some measure have been due to the nutritive properties of the milk."

Epidemic tremors in chickens, C. A. Bottorff, C. L. Martin, A. E. Tepper, T. B. Charles, F. D. Reed, S. H. Shimer, and T. G. Phillips (*Poultry Sci., 14 (1935), No. 5, p. 317*).—In epidemic tremors of chickens, evidenced by distinct and rapid tremor of the head, neck, and tail, an ataxia condition may or may not be present. The mortality may run as high as 65 percent in severe cases, but usually the average mortality is from 15 to 20 percent. All experiments on the method of transmission failed to show any definite results. Brooding susceptible chicks with affected chicks failed to reproduce the disease.

"Various phases of management, such as all types of brooding, variation in temperatures of brooder, and feeding, were negative in all cases. Blood counts and body temperatures showed no significant difference in the cases studied. Field observations indicate that several breeds are susceptible. So far no means of prevention or treatment have been found to be of any value."

Studies of hemophilic bacilli of chickens, J. P. DELAPLANE, L. E. ERWIN, and H. O. STUART (*Poultry Sci., 14 (1935), No. 5, pp. 312, 313*).—This further contribution from the Rhode Island Experiment Station (E. S. R., 71, p. 854) refers briefly to a technic in isolating *Hemophilus gallinarum* in pure culture and to the extranasal reaction of chickens to the organism.

Transmission of fowl paralysis (neurolymphomatosis), E. M. GILDOW, J. K. WILLIAMS, and C. E. LAMPMAN (*Poultry Sci., 14 (1935), No. 5, p. 317*).—In two consecutive trials, 450 and 350 chicks, respectively, obtained by the authors from two paralysis-free flocks, were placed with a similar number of chicks from a flock in which paralysis was present. The results are considered to have established the following points:

"(1) When chicks from a paralysis-free flock were placed with chicks from an affected flock they developed symptoms and lesions of the disease just as early in life as the chicks from the affected flock. (2) A greater percentage of the chicks from the clean source developed the disease than of those from the affected flock. . . . (3) In the affected flock, progeny from old-hen breeding stock were less susceptible than the progeny from pullet-breeding stock. . . . (4) A distinct inheritance of resistance to the disease was demonstrated by certain families in the affected flock. (5) There was no difference in the incidence of the disease in pullets raised on range as compared with those grown in confinement."

A filterable virus, distinct from that of laryngotracheitis, the cause of a respiratory disease of chicks, J. R. BEACH and O. W. SCHALM (*Poultry Sci., 14 (1935), No. 5, p. 314*).—This respiratory disease of chicks is thought by the authors to be the same as that described in 1931 by Schalk and Hawn as apparently new (E. S. R., 65, p. 271) and in 1933 by Bushnell and Brandly as laryngotracheitis of chicks (E. S. R., 68, p. 820).

"Injection of bronchial, tracheal, or nasal exudate of infected chickens into the nasal chambers or tracheas of normal young chickens has regularly produced the disease. The causative agent was found to be a virus which readily passes all grades of Berkefeld candles. This virus has been shown to be neutralized in vitro by serum of immune fowls and to be highly resistant to desiccation and to glycerin, properties typical of viruses as a class. By appropriate tests and certain other criteria, the disease has been shown to be distinct from infectious laryngotracheitis of chickens."

Diseases of brooder chicks, E. JUNGHERR (*[Connecticut] Storrs Sta. Bul. 202 (1935), pp. 56, figs. 22; abs. in Poultry Sci., 14 (1935), No. 5, p. 315*).—This is a practical summary of information on the diseases of brooder chicks, presented with a list of 32 references to the literature. "Since statistical records on the relative importance of various diseases of brooder chicks are meager, the data collected by the writer over a period of 5 yr. in connection with his routine diagnostic work were subjected to analysis. Brooder chicks are defined as being under the age of 10 weeks. The study is based upon the laboratory examination of 4,728 chicks which were received in 873 lots and represent a known affected chick population of 590,794, with an approximate mortality of 10.7 percent. Specific bacterial infections, including pullorum disease, were found in 37.3 percent of the specimen lots, various nutritional and dietary troubles in 22.6 percent, nonspecific bacterial infection in 17.4 percent and protozoan diseases in 11.3 percent; the remaining specimens represented fungus, respiratory, nervous, and miscellaneous disorders."

Observations on pendulous crops of turkeys, W. R. Hinshaw and V. S. Asmundson (*Poultry Sci., 14 (1935), No 5, pp. 314, 315*).—The observations here reported were made principally on a flock of turkeys with pendulous crops, in which the incidence was 5.52 percent in 1932, 3.88 in 1933, and 10.44 percent in 1934.

"In a group of 206 pendulous-crop turkeys kept under observation until maturity or death, 73 (35.44 percent) recovered and remained normal. Of those that did not recover, 72 (34.95 percent) died as a direct result of the condition, 7 (3.39 percent) died from miscellaneous causes, and 44 (21.36 percent) were killed because of emaciation. The remaining 10 (4.85 percent) were killed at maturity as fit for market, but were of poor quality. The common causes of death were ruptured crops caused by self-inflicted lacerations, injury by pen mates, and mechanical pneumonia. . . .

"Data collected during 1934 in a special mating of 3 females and 1 male with pendulous crops and 1 female with a negative history have supported earlier observations that the condition may be influenced by hereditary factors."

The removal of most of the bulbous portion of the crop proved a successful means of correcting the condition in birds to be kept for experimental breeding purposes, the mortality following such procedure approximating 50 percent. Methods of control and treatment, including daily drainage of the crops, washing the crops with water at daily intervals, portioning of drinking water after draining the crops, and various operative procedures, have not influenced the number of recoveries.

Rabbit pox: Report of an epidemic, P. D. Rosahn and C. K. Hu (*Jour. Expt. Med., 62 (1935), No. 3, pp. 331–347, pl. 1*).—Observations of a third epidemic of rabbit pox (E. S. R., 71, p. 394), which occurred in an isolated animal room at the Rockefeller Institute for Medical Research during the winter of 1933–34, are reported.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations by the Department of Agriculture] A. T. Mitchelson, C. E. Ramser, C. S. Scofield, M. W. Hayes, R. V. Allison, J. W. Randolph, I. F. Reed, and R. R. Drake (*U. S. Dept. Agr. Yearbook 1935, pp. 167, 168, 184–187, 236–238, 289–291, 299–305, 313–315, 342–344, figs. 11*).—Progress in the following lines is summarized: Replenishment of depleted ground water by artificial spreading, disposal of run-off water as an essential in erosion protection by terracing, drainage of irrigated lands to correct excessive salinity, river gage work to improve flood forecasting, soil erosion, tillage machinery, and wind erosion control by tillage.

[Agricultural engineering studies by the Alabama Station], M. L. Nichols, I. F. Reed, R. D. Doner, E. G. Diseker, and A. Carnes (*Alabama Sta. Rpt. 1934, pp. 11, 12*).—The progress results are briefly presented of studies of the reactions of various soils to moldboard plows and the relationship of shape of moldboard to shedding, strip cropping and the use of rye and vetch in erosion control, and effects of soil crusts on cotton stands.

[Agricultural engineering investigations by the Idaho Station] (*Idaho Sta. Bul. 217 (1935), pp. 10–12, 26, 48*).—Progress results are briefly presented of pumping operations in emergency drought relief; methods of harvesting field peas; fuel value of briquets from straw, shavings, and sawdust; portable elevators for handling baled hay; and increasing farm water supplies.

[Results of reclamation investigations by the Minnesota Station] (*Minnesota Sta. Bul. 319 (1935), pp. 22–24, 77*).—Some of the principal findings of the station are briefly noted as to concrete draintile, the effect of drainage ditches on forest growth, and the economical reclamation of stump land.

Water utilization in the Snake River Basin, W. G. Hoyt (*U. S. Geol. Survey, Water-Supply Paper 657 (1935), pp. X+379, pls. 26*).—Information is presented on water use in the Snake River Basin, which comprises about 109,000 sq. miles of river, plain, foothills, and mountains.

Surface water supply of the United States, 1933, Parts 1, 2, 6, 8, 10, 12A, 12C (*U. S. Geol. Survey, Water-Supply Papers 741 (1935), pp. X+390, fig. 1; 742 (1935), pp. VII+206, fig. 1; 746 (1935), pp. VIII+276, fig. 1; 748 (1935), pp. VI+180, fig. 1; 750 (1935), pp. V+107, fig. 1; 752 (1935), pp. VI+182, fig. 1; 754 (1935), pp. VI+170, fig. 1*).—These papers present the results of measurements of flow made on streams during the year ended September 30, 1933, No. 741 covering the North Atlantic slope basins; No. 742, the South Atlantic slope and eastern Gulf of Mexico basins; No. 746, the Missouri River Basin; No. 748, the western Gulf of Mexico basins; No. 750, the Great Basin; No. 752, the North Pacific slope basins—Pacific slope basins in Washington and upper Columbia River Basin; and No. 754, the North Pacific slope basins—Pacific slope basins in Oregon and lower Columbia River Basin.

Studies on the survival of B. typhosus in surface waters and sewage, H. Heukelekian and H. B. Schulhoff (*New Jersey Stas. Bul. 589 (1935), pp. 32, figs. 13*).—Studies of the survival of *Bacillus typhosus* in different artificially infected substrates under various environmental conditions, using brilliant green agar for the enumerations, are reported. The studies were further extended to the presence of *B. typhosus* in sewage and the survival in sewage treatment processes.

It was found that the rate of decrease of *B. typhosus* in polluted water and sewage is rapid. Several days' storage will result in a 99 percent reduction with a heavy initial infection. The rate of decrease is affected materially by the temperature, being greater at a temperature of 22° and 37° C. than at 2°.

An actual multiplication of *B. typhosus* with favorable temperatures and in the presence of food supply may take place. This multiplication, however, does not necessarily result in an increase in the survival time, as the rate of decrease after the multiplication stage is greater than without an initial multiplication. The addition to unpolluted water of small amounts of feces, urine, sewage, and broth, and the food carried over in the inoculum from broth culture and agar slants results in actual multiplication, the magnitude depending on the amount of food added. In polluted waters the survival of *B. typhosus* is shorter than in unpolluted waters, probably because of the competition for food from other bacteria and because of protozoan attack. Aeration reduces the survival time of *B. typhosus*. Under starvation conditions the presence of *B. coli* does not affect the death rate of *B. typhosus*, but in the presence of food supply the survival time of *B. typhosus* is reduced by the introduction of *B. coli*. The survival time of *B. coli* is not affected by the presence of *B. typhosus*. The addition of flavobacterium increases the longevity of *B. typhosus*, probably as a result of food made available by the former.

When a normal domestic sewage is sterilized with heat and infected with *B. typhosus* a rapid increase occurs initially. With certain sewages containing industrial wastes the initial increase does not take place, and the survival time is greatly reduced. With various municipal sewages no successful isolation of *B. typhosus* could be made from 0.1 cc of sample. A rapid reduction in the number of *B. typhosus* takes place during the anaerobic digestion of sewage solids. When present in activated sludge-sewage mixtures the numbers of *B. typhosus* increase initially (4 to 6 hr.). The increase is greater when no air is passed. There is a very rapid reduction of the numbers of *B. typhosus* in the activated sludge mixtures after the initial increase, especially in the presence of air. When artificially infected sewage is chlorinated partially, the destruction of *B. typhosus* is of the same order as the destruction of the normal sewage flora. When only 25 percent of the chlorine demand was satisfied, there was over 99 percent reduction of *B. typhosus* in 10 minutes' contact time.

Report on sanitary engineering projects, November 1933–November 1934, E. F. Eldridge, W. L. Mallmann, and F. R. Theroux (*Mich. Engin. Expt. Sta. Bul. 60 (1934), pp. 68, figs. 24*).—This progress report relates, among other features, to studies on the ignition temperatures for sewage and sewage sludge solids, the treatment of sugar beet factory process water by coagulation, the utilization of carbohydrates and proteins by activated sludge organisms, the treatment of meat-packing-plant wastes, a model and experimental water-treatment plant, and sewage coagulation.

Farm irrigation pumping systems, L. J. Smith and H. L. Garver (*Washington Sta. Bul. 311 (1935), pp. 24, figs. 8*).—This bulletin, prepared in cooperation with the Washington Committee on the Relation of Electricity to Agriculture, has for its object "to give farmers who desire to install their own irrigation pumping systems the necessary advice in order that they may obtain satisfactory installations at a minimum cost."

Pasture irrigation, L. J. Smith, M. S. Grunder, and H. L. Garver (*Washington Sta. Bul. 313 (1935), pp. 28, figs. 10*).—The results of studies of pasture irrigation in western Washington conducted by the station in cooperation with the Washington Committee on the Relation of Electricity to Agriculture, the Extension Service of the State College of Washington, and the Western Washington Experiment Station are briefly summarized. In addition, general service information is given on water requirements of pasture, preparation of land for irrigation, sources of water, dynamiting of sloughs for the storage of water, and pasture management.

Experiments were conducted both on one-hundredth-acre plats and on pasture under actual grazing. It was found that very little labor is required with the sprinkler method of irrigation. However, a sprinkler irrigation system is more expensive to install than are other methods. The current cost for sprinkling was found to be higher per acre-inch of water delivered, but this cost was partly offset by the low labor cost and the more efficient use of water.

Data for a 5-yr. period, during 3 of which irrigation was practiced, showed that under irrigation production was maintained in pastures until late September or into October. The conclusion is drawn that lack of moisture is the factor exerting the greatest influence on the production of pasture grass during the summer and early fall months. Temperature does not appear to be a limiting factor until late in September.

Studies of the effect of irrigation and rainfall on soil moisture on three pasture plats showed that light irrigation or ordinary rains do not penetrate beyond the first foot in pasture soils unless they occur so frequently that the upper layers become filled beyond their capacity to retain moisture. Irrigations of 3 or 4 in. reach the second foot when applied to relatively dry soil, but do not appear to affect the third foot to any extent under any of these conditions. Irrigations of from 3 to 4 in. appear to be sufficiently heavy for pasture on the Puget fine sandy loam soil if applications are made frequently enough to prevent the serious drying out of the upper layers.

Effect of cover on surface run-off and erosion in the loessial uplands of Mississippi, H. G. Meginnis (*U. S. Dept. Agr. Circ. 347 (1935), pp. 16, pls. 3,* *figs. 6*).—The study described in this circular forms a part of a soil erosion and run-off investigation begun by the Southern Forest Experiment Station in 1929 in the silt loam uplands east of the Mississippi River. This section, roughly 500 miles long and from 35 to 100 miles wide, is characterized by widespread erosion of an especially destructive type.

A study was made of surface run-off and erosion from comparable soils representing seven combinations of cover type and land use over a period of 2 yr. The measurements were made from 11 small plats laid out on areas having a uniform 10-percent slope.

Rainfall during the 2 yr. totaled 130.7 in. and occurred as 103 rains of from 0.03 to 5.32 in. each. About 28 percent of the precipitation occurred as torrential rainfall and 20 percent as rains of moderate intensity.

For a plat in a cultivated cotton field in which the rows paralleled the slope, surface run-off amounted during the 2 yr. to 58 percent of the total precipitation and in individual rains amounted to as much as 96 percent of the precipitation. On this plat the rate of soil erosion exceeded 195 tons per acre for the 2 yr. For a cultivated cotton field in which the rows paralleled the contour, run-off totaled 47 percent of total precipitation and soil eroded during the 2 yr. totaled 69 tons per acre.

From barren plats in an old field there occurred during the 2 yr. a total run-off amounting to 48 percent of the rainfall, and erosion totaling nearly 160 tons per acre.

In the 2 yr., the run-off from unburned broomsedge plats in an old field amounted to only slightly more than 1 percent of the rainfall, and that from oak forest to less than 1 percent. During no rain did run-off from land of these two classes exceed 5.05 and 3.10 percent of the rainfall, respectively. Erosion from such lands was almost negligible; the quantity of soil washed from each forest plat was to the quantity lost from one cultivated plat as 1:4,300.

Total run-off and erosion from plats in a plantation of black locust and Osage-orange, a Bermuda grass pasture, and scrub oak woodland were somewhat larger than these but were very much smaller than those from barren or cultivated land.

The results of the study are deemed particularly valuable in giving a comparison of surface run-off and erosion losses for different types of cover and in indicating the approximate losses that might occur on larger areas or watersheds where the water tends to concentrate into streams. Because soils having a cover of vegetation absorbed practically all the rainfall, including that of extremely hard rains, and because the soils of the section possess great storage capacity, the general conclusion reached is that in the loessial uplands of Mississippi a plant cover, in addition to preventing abnormal erosion, is of tremendous value in flood control and stream-flow regulation.

The clay ratio as a criterion of susceptibility of soils to erosion, G. J. Bouyoucos (*Jour. Amer. Soc. Agron., 27 (1935), No. 9, pp. 738–741*).—In a contribution from the Michigan Experiment Station the $\frac{\text{sand}+\text{silt}}{\text{clay}}$ ratio is suggested as a possible criterion for judging the relative susceptibility of soils to erosion. This ratio is designated as the clay ratio. It was compared with the erosion ratio by using the same soils and the same mechanical analyses of these soils as reported by the U. S. D. A. Bureau of Chemistry and Soils. The comparison showed that with few exceptions the two ratios agreed fairly well in indicating the general susceptibility of soils to erosion.

Recommendations for the control and reclamation of gullies, Q. C. Ayres (*Iowa Engin. Expt. Sta. Bul. 121 (1935), pp. 71, figs. 50*).—This bulletin deals with the various methods of gully control and reclamation by mechanical means. It is an attempt to capitalize the experience gained in building a large number of dams of many different types in widely distributed parts of the State of Iowa under the Federal emergency conservation program of 1933–34.

The conclusion is drawn that the control and reclamation of gullies is primarily a matter of reducing run-off and checking erosive velocities. In this work, as in other fields of endeavor, prevention is much easier and more economical and effective than corrective treatment. Wherever feasible, cutting off the flow above the heads of gullies by means of diversion ditches or terraces is the most effective single remedy that can be applied. Velocity-reducing structures in gullies may be grouped into three classes—temporary check dams, semipermanent dams, and permanent or soil-saving dams. Conditions governing choice in any given case are cost; degree of dependence to be placed on vegetative cover; willingness to provide necessary maintenance; and physical, environmental, and human factors. Brush check dams seem most effective in regions where sandy soils predominate, and this is true to a lesser extent of all check dams. Brush dams should not be used in other soils unless constant care can be assured. It is essential that livestock be fenced out of gullies being controlled by check dams, and this is a desirable feature for any method of control.

Terracing farm land in Georgia, G. I. Johnson, W. N. Danner, and F. W. Peikert (*Ga. Agr. Col. Bul. 394, rev. (1935), pp. 24, figs. 26*).—This revision (E. S. R., 64, p. 479) presents practical information on farm-land terracing in Georgia.

Soil erosion bibliography, L. H. Wieland (*U. S. Dept. Int., Soil Erosion Serv., 1935, pp. 124*).—This bibliography pertains in the main to (1) processes of erosional behavior under varying conditions of soil, topography, and land use, (2) geographic distribution of eroded and eroding areas, (3) methods of preventing or controlling erosion, and (4) the effect of the products of erosion on the silting of stream channels and reservoirs and the covering of lower slopes and alluvial plains.

Public Roads, [August and September 1935] (*U. S. Dept. Agr., Public Roads, 16 (1935), Nos. 6, pp. 97–123+[1], figs. 13; 7, pp. 125–144+[1], figs. 22*).—These numbers of this periodical contain data on the current status of U. S. Public Works road construction as of July 31 and August 31, 1935, respectively, and the following articles:

No. 6.—Further Studies of Liquid Asphaltic Road Materials, by R. H. Lewis and W. O'B. Hillman (pp. 97–117), and State Motor-Fuel Consumption and Tax Earnings, 1934 ((p. 118–120).

No. 7.—The Los Angeles Abrasion Machine for Determining the Quality of Coarse Aggregate, by D. O. Woolf and D. G. Runner (pp. 125–133), and A Roller-Testing Machine for Measuring the Stability of Bituminous Mixtures, by E. L. Tarwater (pp. 134–141).

The physical properties of West Virginia hardwoods, G. P. Boomslitter (*W. Va. Engin. Expt. Sta. Res. Bul. 12 (1934), pp. 32, figs. 9*).—The results of tests made of the physical properties of a carload of 29 trees embracing 9 species of West Virginia hardwoods are reported and discussed.

Timber for structural use: Its design, working stresses, and preservative treatment, W. H. Greene (*Engin. Jour., 18 (1935), No. 9, pp. 409–412, figs. 7*).—This is a brief technical statement relating to features of structural timber design and preservative treatment.

Vibrations caused by blasting and their effect on structures, E. H. Rockwell (*Wilmington, Del.: Hercules Powder Co., 1934, pp. 69, pls. 2, figs. 43*).—Studies are reported the results of which indicate that ordinarily well-drill blasting, as usually conducted, produces motion and corresponding forces upon objects of so small a magnitude that it is practically certain no damage to buildings in the neighborhood can possibly occur, unless these buildings are within two or three hundred feet of the quarry. In cases of alleged damage resulting from blasting, particularly in localities where there are many houses in close proximity to the quarry and where claims may occur, it is desirable to secure accurate quantitative measurements of the vibrations by some kind of a recorder. If such an instrument cannot easily be obtained, it is important to employ the pin experiment, which is a fairly accurate means of determining the amounts of vibration in well-drill blasting.

A large amount of related technical engineering data are presented in an appendix.

The economic relation of tractors to farm organization in the grain farming areas of eastern Washington, E. F. Landerholm (*Washington Sta. Bul. 310 (1935), pp. 51, figs. 13*).—The purpose of this publication is to point out the trends in the use of horse and tractor power in the grain farming areas of eastern Washington, to aid the wheat farmers of this region in obtaining maximum efficiency in their field operations, and to impress upon manufacturers and dealers the need of supplying proper equipment to meet the particular needs of farmers who operate the wheat farms of the Pacific Northwest and of other farmers growing wheat in areas with rolling topographies. The field data for this study were obtained by a combination of record keeping by the cooperating wheat farmers and a survey. The area studied embraces the wheat region of eastern Washington, consisting of the Palouse or more humid and rolling region on the east and the Big Bend or dry, level, or gently rolling region on the west.

It was found that there is considerable duplication of machine and animal power, the animal power often being unused. Available animal and machine power have been duplicated to such an extent that even with improved farm machinery the number of acres now farmed per unit of power is less than in 1910. Tractor-operated farms are considerably larger than the average according to the census. Out of 56 farmers who had changed wholly from horses to tractors, 41 percent had enlarged their farms. As a result of changing from horses to tractors, 37 percent of the farmers interviewed had rented additional land. The larger the farm, within reasonable limits, the more efficiently can the tractor be utilized. The same is true of horses but to a less marked degree. Tractors have a greater potential capacity for work than have horses if one compares one horsepower to one horse, but this potential capacity often goes unused.

Tractors are comparatively less efficient than horses on small farms and comparatively more efficient on large farms. Similarly, tractors as compared to horses are comparatively less efficient on hilly land than on level land. On 56 farms that had changed wholly from horses to tractors it was found that on hilly land an average of 35 acres was farmed per horse and 31 acres per horsepower. On level land 53¾ acres were farmed per horse and 55½ acres per horsepower.

The average costs of the various field operations on level land were between two-thirds and three-fourths of the cost on hilly land. On hilly land with "30" tractors five 14-in. plows gave the most efficient results from the standpoint of acreage covered and of low cost. On level land six 16-in. and seven 14-in. plows gave the best results. On hilly land, harrows 48 to 50 ft. in width were the most efficient; on level land this width increased from 60 to 66 ft. For weeding hilly land, weeders 24 to 26 ft. in width were most efficient; on level land 30 to 36 ft. For seeding hilly land, drills 21 to 24 ft. in width were most efficient; on level land this width increased to 26 to 33 ft. The most efficient width of harvester (cutter bar) was 14 and 15 ft. for hilly land and increased to 20 ft. on level land. Where the cost of operating the combine was added to the tractor cost the difference in per acre cost of combining at the rate of 18 as compared with 25 acres per day was found to be about 90 ct. per acre.

An appendix gives tabular data.

Ginning cotton, C. A. Bennett and F. L. Gerdes (*U. S. Dept. Agr., Farmers' Bul. 1748* (*1935*), *pp. 11+46, figs. 33*).—This supersedes Farmers' Bulletin 1465 (E. S. R., 54, p. 283). It discusses methods and equipment for handling and processing seed cotton from the time of harvesting until the lint is baled so as best to retain the desirable qualities of the fibers.

Dairy plant efficiency studies (*Vermont Sta. Bul. 396* (*1935*), *p. 23*).—Supplementing Bulletin 388 (E. S. R., 73, p. 858), data are reported as to the accuracy of a wabble-disk milk meter.

Iowa active in rural electrification (*Elect. World, 105* (*1935*), *No. 19, pp. 41, 69*).—A brief description is presented of the rural electrification activities at Iowa State College, with particular reference to those which are being carried on in cooperation with the Rural Electrification Authority.

Burglar proofing the farm, H. N. Colby (*N. H. Univ.* [*Agr.*] *Ext. Circ. 171* (*1935*), *pp. 15, figs. 10*).—This circular describes several methods of farm protection by use of electrical alarm systems, with particular reference to the needs of poultrymen.

Hotbed construction—electric and manure types, C. L. Vincent and H. L. Garver (*Wash. State Col. Ext. Bul. 203* (*1935*), *pp. 12, figs. 4*).—Practical information is given on the construction of electrically and manure heated hotbeds, together with data on costs.

Researches conducted at the National Physical Laboratory under the direction of the engineering committee, E. Griffiths, J. H. Awbery, and R. W. Powell ([*Gt. Brit.*] *Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1933, pp. 213–224, figs. 5*).—This is a progress report of research relating principally to the engineering features of refrigeration, particularly of foods, including meats. Of special interest are the data relating to research methods, apparatus, and procedure. The subjects considered include viscosity of refrigerants, evaporation from wet surfaces, transmission of heat between metal pipes and a stream of air, measurement of humidity at temperatures below 0° C., thermal properties of meat at low temperatures, and corrosion in refrigerating plants.

Important information is reported on the specific heat, thermal conductivity, and thermal diffusivity of beef, which would appear to be of value in the fundamental development of cooking equipment as well as refrigerating equipment.

The refrigerated gas-storage of apples, F. Kidd and C. West ([*Gt. Brit.*] *Dept. Sci. and Indus. Res., Food Invest. Leaflet 6* (*1935*), *pp. 12, fig. 1*).—Supplementing data noted on page 41, British practice in the refrigerated gas storage of apples is described. Information is presented on the prestorage treatment of the fruit and on how to develop the storage itself. Appendixes are included on recommended temperatures and atmospheres for the storage of home-grown apples and on the cost of gas storage.

AGRICULTURAL ECONOMICS

[Agricultural economic studies by the U. S. Department of Agriculture] (*U. S. Dept. Agr. Yearbook 1935, pp. 111–119, 121, 122, 159–164, 188–191, 194–198,* *208–210, 223–227, 241–244, 251–258, 262, 263, 339–341, fig. 1*).—In addition to the statistics noted on page 120, the following general articles are included: Adjustment Program for Longer Future Requires Careful Land Planning, by H. R. Tolley (pp. 111–114); Agriculture Should Study Possible Alternatives to Processing-Tax System, by M. Ezekiel (pp. 114–119); Allotments under A. A. A. Programs Obtained from Census and Other Sources, by S. A. Jones (pp. 121, 122); Credit Facilities for Agriculture Greatly Improved by New Laws, by N. J. Wall (pp. 159–163); Crop Adjustment Needed to Prevent Return to General Overproduction, by L. H. Bean (pp. 163, 164); Farm Laborers in United States Turn to Collective Action, by J. C. Folsom (pp. 188–191); Farm-Management Research Needed in Crop-Adjustment and Land-Use Planning, by C. L. Holmes (pp. 194–198); Forest-Taxation Reforms Dependent on Correction of General Tax Defects, by F. R. Fairchild (pp. 208–210); Grain Standards, Revised and New, Promulgated for the 1934 Marketing, by E. C. Parker (pp. 223–227); Land-Use Study in Georgia Lays Basis for Purchase Project, by W. A. Hartman (pp. 241–244); Marketing Agreements and Licenses Buttress Work of Cooperative Associations, by J. W. Tapp (pp. 251–254); Marketing Studies Show Importance of Increased Efficiency, by F. V. Waugh (pp. 254–258); Minnesota Land-Use Planning Study Points Way to State Action, by R. I. Nowell (pp. 262, 263); and Wheat Exporting from Northwest by U. S. Agency Meets Emergency Problem, by F. A. Theis (pp. 339–341).

[Investigations in agricultural economics by the North Carolina Station, 1932–33] (*North Carolina Sta. Rpt. 1933, pp. 16, 32–34, 70, 81*).—Results of investigations not previously noted are reported on briefly as follows: (1) The average yield per acre and production cost per pound of lint cotton, 1930, 1931, and 1932, and the average cost per pound of producing tobacco, 1931 and 1932, as found by G. W. Forster and R. H. Rogers; (2) a table by J. G. Knapp and G. R. Smith showing the average percentages of grades and staple lengths of cotton ginned in the Tidewater, Upper Coastal Plain, and Piedmont areas, 1932–33; (3) some general conclusions reached by Smith and Knapp in a study of cotton marketing practices in North Carolina local markets; and (4) some findings by Knapp in a study of methods and practices for cooperative purchasing and marketing associations.

[Investigations in agricultural economics by the Ohio Station] (*Ohio Sta. Bimo. Bul. 175 (1935), pp. 162–164*).—Some of the findings in a study of fruits and vegetables received in trucks in the Columbus wholesale market, 1929–34, by C. W. Hauck, are shown in a table, including data by years as to the number of truck loads, sources of supplies, average haul, weight of products, largest weekly and monthly receipts, number of commodities offered, etc. The table of index numbers of production, prices, and income, by J. I. Falconer (E. S. R., 73, p. 703) is brought down through May 1935.

Current Farm Economics, [June and August 1935] (*Oklahoma Sta., Cur. Farm Econ., 8 (1935), Nos. 3, pp. 49–72, figs. 2; 4, pp. 73–88, figs. 3*).—Both numbers include the usual tables and indexes of prices and purchasing power of farm products and demand deposits in Oklahoma, and reviews of the general situation by L. S. Ellis and the dairy situation and outlook by A. W. Jacob. No. 3 also includes reviews of the wheat situation, by R. A. Ballinger, and the poultry and egg situation, by H. A. Miles, and No. 4 of the cotton situation, by Ellis, and the poultry situation, by Miles. No. 3 also includes articles on the Seasonal Trend of Wheat Prices in Oklahoma, 1910 to 1934, by Ellis (pp. 53–55); Income Tax Problems of Farmers' Cooperatives, by B. F. Harrison (pp. 58–63); Quality of Cotton Produced in Oklahoma, 1934–35, by C. C. McWhorter (pp. 64–66); and Social Change in Relation to the Agricultural Situation, by O. D. Duncan (pp. 66–70).

Problems of economic readjustment in the Black Belt of Alabama, C. M. CLARK and J. D. POPE (*Alabama Sta. Rpt. 1934, pp. 10, 11*).—A brief statement is made as to the labor income found for different types of farming and some of the conditions preventing increased efficiency in the different types of farming or shifts to more profitable types.

Types of farming in Puerto Rico, J. E. MCCORD, J. J. SERRALLÉS, JR., and R. PICÓ (*Puerto Rico Col. Sta. Bul. 41 (1935), pp. 54, figs. 35*).—"The main purpose of this publication is to present graphically 'types' or kinds of farming followed in Puerto Rico. An effort has been made to show how physical factors, such as topography, climate, and soils, and economic factors, such as population, land tenure, land values, markets, and others, have a direct or indirect influence in determining the predominant agricultural enterprises in different regions in the island and their relative importance.". The bulletin is intended primarily for those interested in Puerto Rican agriculture and its problems, especially teachers of vocational agriculture, social sciencies, and extension agents.

Maps and tables are included and discussed showing, by municipalities, the topography; temperature; rainfall; soils; population (total and rural): number of farms, land in farms, and improved land by size groups; percentage of improved land operated by managers and by full owners; average value of land and buildings per acre; ratio of mortgage debt to value; transportation facilities; acreage or production of different crops; number of different kinds of livestock; value of crops and livestock sold; returns per farm; the most important and the second most important sources of income; and other data.

A farm management study of small farms in three areas of Puerto Rico, J. E. MCCORD and S. L. DESCARTES (*Puerto Rico Col. Sta. Bul. 40 (1935), pp. 36, figs. 2*).—This bulletin gives the results of a study by the survey method of 63 farms established under the Homestead Commission of Puerto Rico and 88 independent farms in the municipality of Vega Baja and 45 homestead farms in the municipality of San Lorenzo. The capital invested, use of land, crops grown and yields, sales of crops, livestock grown, receipts, expenses, labor income, farm privileges, etc., are discussed.

Analysis is made of the effects on labor income of net cuerdas (0.9712 acre) in crops, gross receipts per farm, total returns per cuerda, relation of cuerdas in crops per man equivalent, crop index, age of operator, and other factors. "Generally as net cuerdas in crops increased, labor income correspondingly increased. All groups having gross receipts less than $100 per farm showed minus labor incomes. One of the most marked relationship existed between gross receipts per cuerda and labor income, showing the necessity of the intensive use of land on the small farms. The groups in all three areas where the farmer handled the largest number of cuerdas of crops per man made the highest labor incomes. Good yields were found to be essential to profit on small farms. Age was a rather important factor in determining the business success of a farmer. The older aged groups in all cases showed the lowest labor incomes."

Cotton production in southern Brazil, P. K. NORRIS (*U. S. Dept. Agr., Bur. Agr. Econ., Foreign Agr. Serv., F. S. 63 (1935), pp. [2]+25, figs. 10*).—This mimeographed report, based on field investigations made in 1934, describes and discusses the cotton-growing area of southern Brazil, its climate, population and labor supply, physical facilities for handling cotton, the production, acreage, and yields of cotton, quality of cotton grown, consumption and exports, marketing and financing cotton, cotton v. coffee, and the outlook for cotton production in the area.

The economic value of improved cotton seed, L. E. LONG (*Mississippi Sta. Bul. 307 (1934), pp. 14*).—This bulletin reports the results found for the 1932 cotton crop in a project undertaken to determine the profitability of planting improved seed. Tables are included and discussed showing the comparative costs of production, value of cotton produced, and quantities and prices pertaining to production of cotton grown from different generations of seed for all varieties, Stoneville cotton, and Delta and Pine Land cotton, and without fertilizer or manure, with manure and no fertilizer, and with different amounts of fertilizer.

The final conclusion drawn is that the planting of first and second generation cottonseed is justified by the financial returns.

Wheat studies of the Food Research Institute (*Wheat Studies, Food Res. Inst.* [*Stanford Univ.*], *10 (1934), Nos. 7, pp.* [2]+*251–288, figs. 8; 8–9, pp.* [2]+*289–352, figs. 26; 10, pp.* [2]+*353–426, figs. 17; 11 (1934), Nos. 1, pp.* [2]+*38, figs. 7; 2, pp.* [2]+*39–73; 3, pp.* [2]+*75–124, pls. 3, figs. 4; 4, pp.* [2]+*125–195, figs. 19; 11 (1935), Nos. 5, pp.* [2]+*197–228, figs. 7; 6, pp.* [2]+*229–254; 7, pp.* [2]+*255–305, figs. 21; 8, pp.* [2]+*307–325, fig. 1; 9, pp.* [2]+*327–358, figs. 6; 10, pp.* [2]+*359–404*).—These numbers consist of the following articles which present the trend of developments in the wheat situation for the period covered: World Wheat Survey and Outlook, May 1934, by M. K. Bennett and H. Working; Decline and Recovery of Wheat Prices in the 'Nineties, by H. C. Farnsworth and P. S. King; Pacific Northwest Wheat Problems and the Export Subsidy, by J. S. Davis, E. C. Blake, A. M. Hobe, P. S. King, and R. F. Lundy; World Wheat Survey and Outlook, September 1934, by M. K. Bennett and H. C. Farnsworth; Decline in Wheat-flour Export During the Depression, by A. E. Taylor; Prices of Cash Wheat and Futures at Chicago Since 1883, by H. Working; The World Wheat Situation, 1933–34—A Review of the Crop Year, by M. K. Bennett, H. C. Farnsworth, and A. E. Taylor; World Wheat Survey and Outlook, January 1935, by M. K. Bennett, H. C. Farnsworth, and A. E. Taylor; Starch and Flour Quality, by C. L. Alsberg; Per Capita Wheat Consumption in Western Europe—I, Measurement, from 1885–86, by M. K. Bennett; Spreads Between Wheat Prices in England, by A. E. Taylor; World Wheat Survey and Outlook, May 1935, by H. C. Farnsworth, M. K. Bennett, A. E. Taylor, R. H. Peirce, and P. S. King; and International Wheat Policy and Planning, by A. E. Taylor.

Costs and returns and factors for success on truck farms in the new truck area of South Carolina, B. A. Russell and J. L. Fulmer (*South Carolina Sta. Bul. 301 (1935), pp. 64, figs. 10*).—Records of farm businesses were obtained from 250 farmers, 161 of which were used in all tabulations. In this new truck area, located in the southwestern Coastal Plains of South Carolina and bordering on the Savannah River, 59 percent of the land is in crops, and of this, 41 percent is in corn, 39 in cotton, 8 in oats, and 7 percent in truck.

In favorable years the large farms make the most profits, but in unfavorable years they sustain the heaviest losses. Large farms have an advantage in being able to provide productive work for labor and mules throughout a longer period of time. Farms combining labor efficiency and high rates of production materially strengthen their chances for gain. The farmers that make most profits over a period of time must have above average size of business, crop yields, and labor, mule, and marketing efficiencies.

An economic study of grape farms in eastern United States.—II, Harvesting and marketing, G. P. Scoville ([*New York*] *Cornell Sta. Bul. 628 (1935), pp. 46, figs. 11*).—This is part 2 of the bulletin previously noted (E. S. R., 72, p. 54). Data are presented and discussed as to methods of marketing grapes, including truck and rail shipments, markets, grape juice, returns from vineyards, grades, containers, and harvesting and marketing costs. Some data are also presented as to costs of growing, harvesting, and marketing a ton of grapes in different producing areas.

Prices received for grapes are analyzed by areas, varieties, and weeks. Grape prices and the general price level, variation in farm prices of grapes, price association of eastern grapes and California grapes and other fruits and vegetables, and the relation between grape prices and grape production in the Chautauqua-Erie belt of New York are discussed.

Marketing apples, J. W. Park and R. R. Pailthorp (*U. S. Dept. Agr., Tech. Bul. 474* (*1935*), *pp. 82, figs. 15*).—The important apple-producing areas and districts and the city apple markets of the United States are described. Information is included as to production and production trends; principal sources, marketing seasons, characteristics, and use of leading apple varieties; the utilization of the crop; harvesting and preparing for market; packages, grades and sizes; Federal-State inspection; loading cars and transportation; cold storage; financing the crop; methods of sale in producing districts; market information; car-lot and boat shipments; the distribution of car-lot shipments and source of market supplies; motor-truck shipments and receipts; methods and channels of city-market distribution; distribution from city markets by trucks; market competition among varieties of apples with other fruits; foreign trade; and prices in producing districts, city-market prices and foreign markets.

Cost of shipping point marketing services for apples in Washington, C. C. Hampson (*Washington Sta. Bul. 312* (*1935*), *pp. 25, figs. 5*).—The study reported was made to bring up to recent date the information on the cost to growers of the marketing services at shipping points, previously noted (E. S. R., 63, p. 886). Tables and charts show, by years 1922–33, for the Wenatchee-Okanogan district, the Yakima district, and the two districts combined (weighted average) the average total costs of packing, for boxes, of warehousing, storage, selling, and the total marketing costs per box at shipping point.

The average costs per box for the two districts combined during the period 1922–33 were as follows: Total packing 38.9 ct., warehousing 7.2, storage 6.1, selling 10.8, and total cost of marketing services at shipping point 63 ct. The average total marketing costs were 65.4 ct. in the Wenatchee-Okanogan district and 59 ct. in the Yakima district.

Poultry management study, R. O. Bausman (*Delaware Sta. Bul. 192* (*1935*), *pp. 12–14*).—A table is included and discussed showing by years 1931–33 the total farm receipts, expenses, and labor income, and the receipts, major expenses, cost of production, profits or losses, and other data for the laying flock and for producing pullets and broilers on 115 commercial poultry farms in Delaware.

Cost of producing turkey hatching eggs in Oregon, A. S. Burrier, F. L. Knowlton, and H. E. Selby (*Oregon Sta. Bul. 333* (*1934*), *pp. 18, figs. 6*).—Analysis is made of data secured in a survey study of 45 representative turkey flocks for the year ended June 1, 1934. Tables and charts are included and discussed showing the average cost, by items, of producing hatching eggs, the cash and noncash costs, feed requirements and cost per hen, labor requirements per farm for the breeding flock, capital requirements per hen and per farm, variation in cost per hatching egg on different farms, etc. The effects on cost of yield of hatching eggs per hen and size of flock are discussed.

The average cost of producing hatching eggs was 13.6 ct. per egg. The average production per hen was 38 hatching and 4 cull eggs. Of the total cost, feed constituted 38 percent, labor 20, depreciation 30, and other items 12 percent. Cash expense items amounted to 48 percent and noncash items to 57 percent. Costs on individual farms varied from less than 10 ct. to nearly 30 ct. per hatching egg, only 40 percent of the farms having a cost of less than 15 ct. On farms producing less than 25 hatching eggs per hen, the average cost per egg was 18.2 ct., as compared with 11.4 ct. on those producing 40 or more eggs per hen. The larger flocks had the lower costs per hen for labor, feed, and use of land and equipment and the lower total costs per hen and per hatching egg.

An economic study of dairy farming in the Norfolk milkshed, J. J. Vernon, W. H. Fippin, and H. N. Young (*Virginia Sta. Bul. 298 (1935), pp. 102, figs. 12*).—This study is based on 126 records from dairymen supplying the city of Norfolk during the year ended March 31, 1932.

Because of the difficulty of maintaining high-quality permanent pastures, the Norfolk milkshed is not well adapted to the economical production of dairy products. Of the 126 farms studied, 19 were classified as retail and 107 as wholesale milk farms. The average size of the 107 wholesale milk farms was 217 acres, with 90 acres in crops. The average size of the dairy herd was 28.3 milk cows, and the average man equivalent, including the operator, was 4.5. The average investment was $28,047, of which 79.1 percent was invested in real estate and 20.9 percent in working capital. The average total receipts of these wholesale milk farms were $7,368.06, while the expenses amounted to $7,480.58, or a loss of $112.52. When interest on the average capital investment was added to this the average labor income was —$1,578.86, or —4.4 percent.

An average of 6,101 lb. of milk was produced per cow. The average gross cost of wholesale milk production was $3.60 per 100 lb. of milk sold. Deducting credits other than milk sales, the net average cost per 100 lb. of milk sold was $3.25. The returns from milk sales were $3.27 per 100 lb., leaving a net profit of 2 ct. per 100 lb. of milk. Important factors affecting the price received were the proportion of the milk sold at basic prices and the average butterfat test.

About one-fourth of the wholesale dairymen were overfeeding poor cows, and many dairymen placed too much dependence upon early and late pasture. Labor and capital were used more efficiently on the large than on the small farms. Specialized dairy farms had, on the average, better cows, produced milk at lower cost, and obtained a better price for the milk sold than farmers 39 percent or more of whose productive work was spent on some enterprise other than cows.

High-producing cows were generally associated with low cost of milk production. The combination of good cows and high labor efficiency was associated with a lower cost of production, but high-producing cows were more important than labor efficiency from the standpoint of either the dairy enterprise alone or the farm business as a whole.

Farm organization and cost of milk production (*Vermont Sta. Bul. 396 (1935), pp. 16, 17*).—Some preliminary findings in the analysis of 450 farm business records secured in the Champlain Valley in 1933 are given.

Dairy ratios, C. C. Hampson (*Washington Sta. Bul. 309 (1935), pp. 39, figs. 9*).—This bulletin presents for the period January 1914 to March 1935, inclusive, tables and charts showing (1) the monthly prices at Seattle of butterfat, market milk, alfalfa hay, weighted average grain (30 percent mill run, 30 oats, 20 barley, and 20 percent linseed meal), mill run, oats, barley, and linseed meal; (2) the monthly butterfat-grain feed, market milk-grain feed, butterfat-alfalfa hay, and market milk-alfalfa hay ratios; and (3) the index numbers (base 1928-32=100) of the four ratios.

The method used in the calculation of the ratios and index numbers are described, and the ratios and their interpretation and use are discussed.

Farm prices in California, H. J. Stover (*California Sta. [Bul. 569, Sup.] (1935), pp. 13*).—Statistical data are included, revising and bringing the tables of prices and index numbers previously noted (E. S. R., 72, p. 410) through July 1935.

Agricultural statistics (*U. S. Dept. Agr. Yearbook 1935, pp. 345–746*).—This section is prepared under the direction of J. A. Becker et al., the statistical committee of the Bureau of Agricultural Economics. It "brings together what seem from experience to be the most important agricultural statistics of the United States, and of the world so far as the agriculture of this country is concerned. Important historical and geographical series have been given for the more recent years. Most of the data for earlier years not covered in this Yearbook will be found in previous issues."

Statistics are included for different grains; cotton, sugar, and tobacco; different fruits and vegetables; miscellaneous crops; beef cattle, hogs, sheep, horses, mules, poultry, and dairy and poultry products; foreign trade in agricultural products; farm business and related subjects, including ten summary tables indicating the results of the Agricultural Adjustment Administration's work; and miscellaneous items, including meteorological data.

"In this Yearbook are shown for the first time historical revisions prior to 1919, by which the currently published estimates have been made consistent with the decennial census figures, supplemented by State enumerations. These historical revisions are limited at present to the first tables, or master tables, under wheat, corn, oats, and cotton."

RURAL SOCIOLOGY

Status of and prospects for research in rural life under the New Deal, D. Sanderson (*Amer. Jour. Sociol., 41 (1935), No. 2, pp. 180–193*).—In an address before the Section on Rural Sociology of the American Sociological Society at Chicago, December 28, 1934, the author explained that the tendency now is to regard social research not as a means of discovering immutable laws of social science but of attaining new goals of economic welfare. Attention is called to an increasing tendency to use social research in developing administration policies. To achieve a better balance between rural and urban economy, in this way, will inevitably involve a marked increase in rural research including service research, fact-finding and interpretation, social dynamics, experimental research, and social evaluation. While science cannot establish ultimate values, it can test existing or proposed human institutions in terms of the values claimed for them. Insofar as a New Deal is realized, old institutions will be tested to determine whether they function to produce the values desired. The prospects for social science are therefore limited only by its ability to meet the demands which will be made upon it.

Population trends in North Carolina, C. H. Hamilton (*North Carolina Sta. Rpt. 1933, pp. 81, 82*).—An unpublished analysis showed that the cities of the State would ultimately decrease about 1 percent per annum were it not for migration from towns and farms. Farm population, on the other hand, would increase about 2 percent were it not for migration to the cities and towns. Farm birth rates were found to be approximately double those of the city.

Interests, activities, and problems of rural young folk.—II, Men 15 to 29 years of age, W. A. Anderson and W. Kerns (*[New York] Cornell Sta. Bul. 631 (1935), pp. 43, fig. 1*).—This is part 2 of a general study of the interests, activities, and problems of rural young people from 15 to 29 yr. of age. It deals with 807 young men living in the open country and villages of less than 2,500 inhabitants in Genesee County. Part 1 reported a similar study of the young women of the same area (E. S. R., 73, p. 267).

Out of 1,278 different interests reported by these 307 young men, 91 percent were social-recreational and economic-vocational. Aesthetic, educational, civic, and religious interests made up the other 9 percent. Finding a way to increase their income ranked first among 36 topics; then followed personality development, home beautification, and others.

More than one-half of the young men said they had no vocational plan for the next 5 yr. and 48 percent said they had chosen no life work. Vocational guidance, therefore, is an important need of these young men. If opportunities presented themselves, 32 percent of the men would follow a skilled trade, 18 percent would farm, 16 percent would follow a profession, and 13 percent said they had no choice. The remainder indicated a desire for work in clerical, public, and semiskilled fields.

In their organizational interests, 60 percent of them wanted a Y. M. C. A., an athletic club, a Boy Scout group, or some social and recreational club. Practically all of the young men liked living in the country, only 4 expressing a dislike for it. In spite of the fact that most of them did not plan to remain in rural areas or to farm, rural life and farm work appeared to have a genuine interest for them.

Leisure-time activities carried on during an average of 4 hr. a day included reading, baseball, swimming, listening to the radio, motoring, and loafing and resting. Reading was mentioned most frequently as a leisure activity.

The study revealed that these young men had many interests, a variety of problems, and many activities, though largely of unguided and undirected types. They were anxious for means to satisfy their social and vocational needs.

Attitudes of high school seniors toward farming and other vocations, M. E. Frayser (*South Carolina Sta. Bul. 302 (1935), pp. 32, figs. 2*).—This study was based on data taken from 924 white and 566 negro high school seniors who filled in questionnaires furnished them in 1932 and 1935. Thirty-seven white high schools in 20 counties and 15 negro high schools in 15 counties cooperated.

About 44 percent of the white and 25 percent of the negro youth studied were favorable in their attitude to farm life. The percentages of the youth of both races desiring to live on the farm were higher for the children of owner than of nonowner farmers. About 69 percent of the white and 71 percent of the negro youth agreed that farm life had pleasant aspects not incident to city life, notably enjoyment of nature, the healthfulness of country life, freedom, independence, and home-farm production of food.

Outstanding among the reasons given for leaving the farm were low farm income, frequent lack of modern farm and home equipment, and the belief that cities offer more attractive economic, social, and educational opportunities. The lack of adequate rural educational advantages was instanced more frequently by the negro than by the white students.

The percentage of boys who expected to attend college was greater than the percentage of girls who planned to do so. A smaller percentage of the sons and daughters of white parents engaged in farming planned to attend college than was true of the sons and daughters of white parents in nonfarming occupations.

Engineering led as the professional choice of the white boys and teaching as that of the white girls. Among the professions teaching was the first choice of both the negro boys and girls who planned to attend college.

Farming was the first occupational choice of the white boys and nursing of the white girls who had no expectation of going to college. The percentage of white boys choosing farming as an occupation was higher for boys not anticipating college attendance than for those who expected to attend. In the group not expecting to enter college, the number of negro boys choosing each occupation listed by them was too small to indicate any unanimity of opinion, while nursing led the occupational choices of the negro girls.

In 1935 a large proportion of those who were graduated from high school in 1932 had not found their places in the working world.

FOODS—HUMAN NUTRITION

[Foods and nutrition] (*Minnesota Sta. Bul. 319* (*1935*), *pp. 46–48*).—A brief summary is given of the research program in this field carried on in the home economics division since 1926.

The nutritive value of milk, W. C. Russell (*New Jersey Stas. Circ. 356* (*1935*), *pp. 4*).—The nutritive value of milk is discussed briefly and nontechnically as were eggs in a previous circular (E. S. R., 72, p. 561).

Milk is considered an important and convenient source of calcium and phosphorus, one of the more important sources of vitamin G and (at least for infants and young children) of vitamin A, and a unique source of fat because of the homogenized form in which it occurs. "The most significant thing about milk is that no other single, naturally occurring food contains so many dietary essentials in important amounts, and it is the most economical source of many of them that we have."

The nutritive value of the fatty acids of lard and some of their esters, S. Lepkovsky, R. A. Ouer, and H. M. Evans (*Jour. Biol. Chem.*, *108* (*1935*), *No. 2, pp. 431–438, figs. 3*).—Previously noted studies on the effect of the fatty acids of lard and their ethyl esters on the growth of rats (E. S. R., 67, p. 779) were repeated with the same materials fed at levels of 25 and 60 percent of the diet, and the work was extended to include the synthetic glycerides, methyl esters, and esters of ethylene glycol, propylene glycol, and diethylene glycol.

Of the different forms of lard fatty acids studied, the glycerol ester of synthetic lard proved the best and even more satisfactory for growth than the untreated lard. The free fatty acids gave satisfactory results at the 25 percent level but less satisfactory at the 60 percent level. No improvement resulted from adding glycerol to the free fatty acids. The methyl and ethyl esters likewise gave good results at the 25 percent level and poor at the 60 percent level. Of the other esters tested, that of propylene glycol gave the best results, although inferior to the glycerides. The kidneys of the animals receiving ethylene glycol and diethylene glycol showed severe lesions.

The effect of fertilizers and soil types on the mineral composition of vegetables, J. M. Coleman and R. W. Ruprecht (*Jour. Nutr.*, *9* (*1935*), *No. 1, pp. 51–62*).—In this contribution from the Florida Experiment Station mineral analyses, including manganese and copper, are reported for various truck crops grown under known conditions of fertilizer treatment and on known soil types in various sections of the State. The Official methods were used for the most part. Copper was determined by the Biazzo method as modified by Elvehjem. No precautions were taken to avoid contamination of the samples with iron, and consequently the iron values are probably high.

Tabulated data are given on the mineral composition of tomatoes, lettuce, and celery grown under various methods of fertilization; the phosphate content of soybeans grown on soils treated with various phosphate fertilizers; the mineral composition of tomatoes, potatoes, string beans, and cabbage grown on several different soils; and the content of nitrogen, phosphorus, and potassium in the various soil types. Moisture determinations on beans, carrots, cabbage, celery, lettuce, potatoes, tomatoes, beets, peppers, strawberries, and turnips are reported in comparison with corresponding data of Peterson and Elvehjem, and for the same materials ash constituents in percentage of the edible portion of the fresh material in comparison with Sherman values and manganese and copper in comparison with data reported from several sources.

From the data reported the authors conclude that "complete fertilizers containing nitrogen, phosphoric acid, and potash, when used in the usual amounts necessary for optimum crop production, exert very little influence on the composition of the crops grown with them. Heavy applications of fertilizer will nullify any effects which soil types may have on the composition of the crop. Florida grown vegetables are as high in minerals, including copper and manganese, as vegetables produced in other sections of the country. In some cases their mineral content is higher than that of vegetables from elsewhere."

Pinto beans: Their preparation and palatability, M. L. Greenwood (*New Mexico Sta. Bul. 231* (*1935*), *pp. 16*, *fig. 1*).—Following a brief introductory section in which the origin, history, and economic importance of the pinto bean are discussed, the report is given of a study of factors affecting the palatability of the beans on cooking, including hardness of water, use of soda, and length of soaking and cooking periods. Tests were also made of the effect of locality and frequency of irrigation upon the palatability of the beans.

The age, locality, and the amount of water applied in irrigation had no appreciable effect on the palatability of the cooked beans. The degree of hardness of the water was found to be the most important factor affecting cooking quality. It is recommended that if hard water is used it should be boiled vigorously for a period of from 20 to 30 min. before the beans are cooked. The best results were secured by soaking the beans in a hot 0.5 percent solution (1½ teaspoonfuls to 5 cups of water) of baking soda.

The cooking methods found most satisfactory for both soft and hard water are described.

Cooking quality of certain potato varieties as influenced by environment, F. J. Stevenson and E. F. Whitman (*Amer. Potato Jour.*, *12* (*1935*), *No. 2*, *pp. 41–47*).—This contribution from the U. S. D. A. Bureaus of Plant Industry and Home Economics consists of a statistical study of the data on the cooking quality of potatoes of the Katahdin variety grown in 32 localities in 17 States and at Winnipeg, Canada, in 1932, and of the Chippewa, Green Mountain, and Russet Burbank varieties grown in 24 localities in 14 States in 1933.

All of the varieties showed significant differences in quality when grown in different places. "It is significant that samples of each of the varieties tested varied almost from one extreme to the other in a scale of five classes in spite of the fact that the tubers were grown in comparatively few locations. The significance of these variations is shown in the high F value for locations. The inherent differences among the varieties are apparent in that one variety tends to maintain better quality than another over a wide range of conditions, as shown by the high ratio obtained between variance due to varieties and variance of error. A significant interaction between varieties and locations indicates varietal adaptation, so that if comparisons are to be made between two varieties it must be known that they were grown under very similar conditions."

The nutritive properties of soybean-egg powder, a substitute for cow's milk in infant dietary, E. Reid (*Chinese Jour. Physiol.*, *9* (*1935*), *No. 1*, *pp. 27–42*, *figs. 12*).—Modifications in the method of preparing soybean-egg powder (E. S. R., 71, p. 722) are described, and feeding experiments on rats are reported in which the growth-promoting properties were compared of soybean-egg powder and whole-milk powder, with and without iron. The weights of the thyroids and livers of the rats were determined to detect possible enlargement, and the weights of the bones and ash content were determined as a test of the antirachitic power of the soybean-egg powder. Observations were also made of the blood hemoglobin and red cell count.

In the modified powder the fat content has been raised so that the caloric value is almost as high as that of whole-milk powder, and the calcium supplement has been increased to bring the Ca:P ratio close to unity. Male rats on the soybean-egg powder gained weight more rapidly than corresponding animals on the whole-milk powder, with or without iron. Females grew equally well on either diet if the whole-milk powder was supplemented with iron. Blood hemoglobin was normal in all of the rats fed soybean-egg powder in contrast with the well-known anemia on milk powder. The livers of the soybean-egg powder animals showed no enlargement, although containing slightly more fatty acids and cholesterol than those of rats fed the whole-milk powder supplemented with iron. No enlargement of the thyroid was observed, and the percentage of ash in the bones was normal. The ratio of weight of bones to weight of animals was lower in the animals fed the soybean-egg powder.

Soy bean milk in infant nutrition (*Jour. Amer. Med. Assoc., 104 (1935), No. 23, pp. 2098, 2099*).—This editorial discussion of the literature on the subject closes with the statement that "there appears to be considerable evidence, therefore, to warrant the conclusion that the soybean is destined to assume a role of importance in infant nutrition."

The effect of prunes and the water extract of prunes on the plasma CO_2 combining capacity and composition of the urine when included in acid, neutral, and uncontrolled diets, E. Mrak, C. Smith, J. Fessler, H. Lambert, and T. Harper (*Jour. Nutr., 8 (1934), No. 6, pp. 633–646*).—The addition of 12 and 18 prunes (40–50 size canned in sirup) to neutral and acid diets of 8 healthy young men caused in general an increase in the organic acids and a decrease in ammonia, total acids, and pH value of the urine. The inclusion of prunes in the uncontrolled diet of several subjects had no appreciable effect on urinary values.

The plasma CO_2 combining power of the blood was not changed significantly when 6, 12, or 18 prunes or 120 cc of prune juice were included in the neutral, acid, or uncontrolled diets. The greatest variation in plasma CO_2 combining power and urinary pH occurred on the uncontrolled diet but without relation to prunes.

Effect of heat and alcohol extraction on the nutritive value of casein, H. W. Schultz, W. H. Seegers, and H. A. Mattill (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 7, pp. 1026–1029, fig. 1*).—The effect of alcohol extraction of casein on the value of a diet in supporting lactation in rats in the first and second generations was tested by the method of Kozlowska, McCay, and Maynard (E. S. R., 67, p. 770), using diets containing commercial casein (diet A) or casein which had been extracted in a percolator for 4 days with boiling 95 percent alcohol (diet B). Lactation was much better on diet A than on diet B, but the difference was only slightly accentuated in the second generation.

The effect of extraction plus heat treatment (2 hr. at 120° C. and 30 min. at 150°), with and without supplementing the diet with a hot alcoholic extract of wheat germ, was also tested. The least satisfactory results were obtained with casein extracted for 4 days and heated for 4 hr. at 120°. This ration was improved by supplementing it with the wheat germ extract, but the extract had no supplementing effect for the ration containing extracted casein heated for 30 min. at 150°. Ether extracts of wheat germ were ineffective.

The favorable effect of the alcoholic extract of wheat germ on growth rate is thought not to preclude the possibility of protein damage in heated casein, as shown by other investigators. A more plausible explanation is that the extract provides a labile factor, possibly B_4, which is removed from casein by alcohol extraction and is present in yeast in only small amounts if at all.

Dextrose in malnutrition, G. Stearns, R. Catherwood, and A. Kantrow (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 9, pp. 1463, 1464*).—The hypothesis that the ability of children to utilize fats and starches may be impaired in malnutrition of a relatively mild type, as has been observed in children with severe malnutrition and accompanying diarrhea, was tested on 5 children from 8 to 13 yr. of age and from 10 to 20 percent underweight. Three types of diet were used—a normal diet similar to the customary hospital diet, a fat diet containing increased amounts of butter and cream, and a dextrose diet rich in protein, minerals, and vitamins, very low in fat, and containing the carbohydrate almost wholly in the form of dextrose. Each child was given at least two of the diets in turn for periods of from 9 to 12 days. The average gains in weight on the three diets were calculated as total gains per day, with the corresponding calories per pound per day.

Consistent and satisfactory gains were rarely observed if the calorie intake was below 45 calories, and regular gains were the rule whenever the daily intake was greater than 50 calories per pound on any of the diets. With any caloric intake, the largest and most consistent gains were made on the dextrose diet, from 250 to 500 additional calories being needed for similar gains on the fat diet.

No child showed glycosuria at any time, but one of the children excreted more than 100 mg of acetone bodies daily on the fat diet. Sugar tolerance curves showed the highest rise of blood sugar after the fat diet and the lowest after the dextrose diet. No ill effects were observed following the ingestion of large amounts of dextrose.

"It is concluded that a diet rich in protein, minerals, and vitamins, low in fat, and containing its carbohydrate largely in the form of dextrose is best suited to produce rapid and consistent gain in weight of undernourished children. The caloric intake should be above 50 calories per pound of body weight."

Calcium, phosphorus, and nitrogen retention of children: Effects of acid-forming and base-forming diets, N. J. Davis (*Amer. Jour. Diseases Children, 49 (1935), No. 3, pp. 611–624*).—An extensive comparison is reported of the effects of acid-forming and base-forming diets on the calcium, phosphorus, and nitrogen metabolism of 12 children (4 boys and 8 girls) between the ages of 7 and 12 yr. The diets, which were regulated by varying the amounts of similar natural foods, were proved to be acid- and base-forming by chemical analysis and by the reaction of the urine.

With the basic diet the excretion of calcium increased in the stool and decreased in the urine, and with the acid diet the percentage of phosphorus excreted in the stools decreased very slightly and that in the urine increased. The retention of calcium was uniform and not influenced by the reaction of the diet, while that of phosphorus tended to increase to a very slight extent on the acid diet. The highest retentions of calcium, phosphorus, and nitrogen were noted on two of the three basic diets, but the retentions of calcium and phosphorus were equally high on the acid diets. The retention of nitrogen was definitely higher on the basic than on the acid diets. These findings are thought to suggest that if any disadvantage to children exists in the use of acid diets it is in the protein rather than in the calcium and phosphorus metabolism.

The data for calcium and phosphorus retentions are discussed in comparison with various studies reported in the literature, with emphasis on the probable reaction of the diets in the earlier studies. "These comparisons suggest support of the hypothesis of Daniels and her coworkers [E. S. R., 71, p. 881], namely, that the retention of calcium and phosphorus is primarily governed by the physiologic need of the subject rather than by the reaction of the diet, the calcium-phosphorus ratio or the magnitude, or the food source of the intake. It should be noted, however, that in none of the studies of children (other than of rachitic infants) so far reported can the influence of vitamin G be gaged, since there are involved the factors of the varying amounts of exposure to sunshine or to ultraviolet light and of the ingestion of cod-liver oil or of viosterol. Parallel experiments on animals seem to indicate that when the amount of vitamin is restricted all of these factors come into play."

Copper and iron in human blood, A. Sachs, V. E. Levine, and A. A. Fabian (*Arch. Int. Med., 55 (1935), No. 2, pp. 227–253, fig. 1*).—This paper reviews the literature on the biologic functions of copper, describes a method of determining copper in blood involving preliminary precipitation of iron with ammonia followed by the use of the McFarlane technic (E. S. R., 70, p. 12), and presents data on the iron and copper content of the whole blood of men and women, both normal and pathological, and of pregnant women and new-born infants.

From the data reported the normal values for copper in whole blood are considered to be for men 0.131±0.0008 and for women 0.131±0.0012 mg per 100 cc of blood. The average values for iron were for men 50.13±0.15 and for women 43.42±0.19 mg per 100 cc. The modal values were 50 and 45 mg, respectively.

On the basis of the fact that hemoglobin contains 0.335 percent of iron, the average whole blood of normal men is estimated to contain 14.96±0.045 g of hemoglobin per 100 cc and that of women 12.96±0.06 g. Attention is called to the convenience and accuracy of converting values for the iron content of whole blood into hemoglobin by multiplying by 2 and 2.22 in the case of men and women, respectively.

An increase in the copper content of the blood, or hypercupremia, was observed in various pathological conditions, including secondary, pernicious, and sickle cell anemia, tuberculosis, malaria, arsenic poisoning, and carcinoma. In anemia the increase in copper is accompanied by a decrease in iron. "That copper plays a significant role in hematopoiesis is suggested by its increase in the blood stream in almost all anemic states. Our figures indicate that the majority of patients with anemia, regardless of its chronicity or severity, show hypercupremia. It is evident, therefore, that sufficient quantities are stored for and made available in emergencies. This fact minimizes the possibility of the occurrence of anemia caused by the deficiency of copper in man."

In 25 pregnant women the average copper value was 0.195 mg per 100 cc, representing a 50-percent increase over the average of 50 normal women not pregnant. The average iron value, 40.44 mg per 100 cc, was somewhat below the modal value for nonpregnant women of 44 mg. "Hypercupremia of pregnancy, when associated with a normal iron content, is physiologic and reflects the normal mechanism of transporting copper from the maternal blood to the fetal reservoirs. Hypercupremia of pregnancy, when accompanied by hypoferronemia, may represent not only this mechanism but also mobilization of copper to combat the anemia which is commonly found in the pregnant state."

In 5 comparisons of maternal blood and the blood of the umbilical cord, the former was from two to four times as rich in copper as the latter but less rich in iron.

The biological significance of copper and its relation to iron metabolism, C. A. Elvehjem (*Physiol. Rev., 15 (1935), No. 3, pp. 471–507*).—This review summarizes briefly the earlier literature on the distribution of copper in plant and animal life and its role in marine animals and as a constituent of the highly colored pigment turacin, and discusses the more recent literature on the presence of copper in higher animals, the establishment of copper as an essential element in nutrition for the formation of hemoglobin, the improvement of technic for copper determinations and the copper content of foods and feeding stuffs, and the place of copper in the treatment of anemia, its role in plants and micro-organisms, and the mechanism of its activity. An extensive list of references to the literature is appended.

A study of the iron metabolism of normal women, M. A. Ohlson and K. Daum (*Jour. Nutr., 9 (1935), No. 1, pp. 75–89, fig. 1*).—Three normal women carrying an active schedule of laboratory work served as subjects of iron metabolism studies at intervals during a period of 2½ mo., with a total of 56 experimental days. Each subject was consulted concerning her food likes and the approximate amount of food which she customarily ate. The information thus secured was translated into a foundation dietary which was varied in the choice of meat, vegetables, and dessert. Sulfuric acid digests were prepared of food and feces, and iron was determined by the Murray (E. S. R., 52, p. 411) modification of the permanganate titration method and copper by the method of Ansbacher, Remington, and Culp (E. S. R., 66, p. 505).

The average quantity of iron ingested was 13.78 mg and excreted 14.95 mg daily. One of the subjects had a positive iron balance in two out of the three periods. The other two subjects were in negative balance throughout. Totals of 18.16, 25.68, 32.85, and 41.90 mg of iron were lost in menstruation during each of four periods. No relationship was observed, however, between the iron retentions and the iron losses during menstruation or between the balance of nitrogen or copper and that of iron. The copper to iron ratios of the ingested food ranged from 1 to 12 to 1 to 17, and the copper ingested from 0.8 to 1.39 mg daily. The excretion of copper was almost entirely by way of the feces, and the balances were for the most part negative, on the average ranging from —0.02 to —0.4 mg daily.

Effect of a diet low in magnesium on the rat, D. M. Greenberg and E. V. Tufts (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 5, pp. 674, 675*).—In this preliminary note, attention is called to the syndrome termed magnesium tetany described by Kruse, Orent, and McCollum (E. S. R., 70, p. 560) as resulting in rats from a diet containing only 0.18 mg magnesium per 100 g. An entirely different sequence of symptoms is reported as having been obtained in rats on diets containing between 1 and 2 mg of magnesium per 100 g of a dry food composed of casein, sucrose, vegetable fat, vitamin supplements, and a purified salt mixture.

On this diet the rats do not suffer spontaneous convulsions, but convulsive seizures can be induced by suitable stimuli. The plasma magnesium, while lower than that of controls, falls within the range of variation reported for normal animals. The body magnesium is considerably reduced.

In animals fed a diet low in vitamin G, the stage at which convulsions can be induced is reached much sooner than in those given larger amounts of this vitamin. With ample provision for vitamin G and at the magnesium level stated, the changes such as loss of hair, emaciation, and edema of the feet, described by Kruse et al. as characteristic of the terminal stage of the deficiency, are not produced.

Studies on the importance of manganese for animals [trans. title], G. Bertrand and H. Nakamura (*Bul. Soc. Chim. Biol., 17 (1935), No. 1, pp. 81–87, figs. 6*).—Following the same plan as in an earlier study of zinc (E. S. R., 52, p. 161), the importance of manganese in nutrition has been studied with mice, with the conclusion that it is an essential element.

Retarded growth and longevity (*Jour. Amer. Med. Assoc., 104 (1935), No. 20, pp. 1826, 1827*).—This editorial discussion is based chiefly on the studies of McCay and Crowell (E. S. R., 73, p. 557).

Body build in infants, VI–VIII, H. and R. M. Bakwin (*Amer. Jour. Diseases Children, 49 (1935), No. 4, pp. 861–869, figs. 3; pp. 870–875, figs. 6; pp. 876–883, figs. 6*).—In continuation of the series of papers noted in part (E. S. R., 73, p. 415), three papers are presented.

VI. *Growth of the cardiac silhouette and the thoraco-abdominal cavity.*—The dimensions of the cardiac silhouette and the thoraco-abdominal cavity by certain subdivisions of age under 1 yr. were measured in 165 boy and 146 girl infants, for the most part of poor parentage, born in Bellevue Hospital and supervised for a year in a special clinic devoted to well babies. The changes in the shape and size of the two measurements are described. It is noted in particular that the transverse diameter of the heart during infancy is poorly correlated with height, weight, and width of the thorax.

VII. *Effect of retarded growth on the dimensions of the cardiac silhouette and the thoraco-abdominal cavity.*—Measurements similar to those reported in the preceding paper were obtained for 234 undernourished infants studied simultaneously. A comparison of the two series of data shows that for the same height the malnourished infant has a smaller heart and thoracic cavity, a narrower mediastinum, and a larger abdominal cavity than the well-nourished infant.

VIII. *Influence of retarded growth on the dimensions of the ulna and the radius.*—The groups of healthy and undernourished infants of the two preceding studies were compared as to configuration, relations, and texture of the ulna and radius. "It was shown that the ulna and radius of undernourished infants grow more slowly in all dimensions than those of normal infants. The bones of the undernourished infants were narrower in relation to the length of the bones and to the total body length than those of the normal infants. There was no difference between the two groups in the rate of ossification of the carpal centers."

Breast and artificially fed infants: A study of the age incidence in the morbidity and mortality in twenty thousand cases, C. G. Grulee, H. N. Sanford, and H. Schwartz (*Jour. Amer. Med. Assoc., 104 (1935), No. 22, pp. 1986–1988, figs. 6*).—The data reported on in a previous paper (E. S. R., 73, p. 129) have been analyzed further with respect to the morbidity and mortality of the two groups by ages in months and for respiratory, gastro-intestinal, and unclassified diseases, together with the proportion of these cases to the total number of children in the group.

In the respiratory infections there was a rise in all groups to the fifth month, with the morbidity decreasing after the sixth and seventh months in the breast- and partially breast-fed groups and continuing to rise through the ninth month in the artificially-fed group. In gastro-intestinal morbidity there were too few cases among the breast-fed to calculate percentages. In the partially breast-fed infants the peak was at 5 mo. and in the artificially-fed at 7 mo. In the miscellaneous group there was a rapid rise to a peak at 5 mo., continuing with the artificially-fed to 8 mo.

The mortality of the breast-fed infants was almost entirely in the first 2 mo. of life. In artificially-fed infants the mortality from respiratory infections was high during the first 4 mo., then decreased, and rose again at the ninth month. In gastro-intestinal disturbances and unclassified diseases, the mortality among the artificially-fed infants was high for the first 4 mo., decreasing to a level at the end of the ninth month.

Growth and basal metabolism.—IV, Changes in the basal metabolism of children during a year, I. Nakagawa (*Amer. Jour. Diseases Children, 49 (1935), No. 5, pp. 1232–1239*).—This report covers a study of the basal metabolism, as determined by the technic described in the first paper of the series (E. S. R., 72, p. 721), of 26 Japanese children aged from 3 yr. 10 mo. to 11 yr. 2 mo. for every other month during a year. Data are also included on the weight, height, and urinary nitrogen determined at the same intervals and on the diet of the children previous to the experiment.

The increase in heat production from the beginning to the end of the experiment amounted to about 30 calories per year for all of the subjects. In the girls there was a higher rate of increase at the ages of 11 and 12 yr. This is thought to be attributable to the increased rate of growth at puberty. The yearly increase did not take place gradually, but showed seasonal variations, the maximum increase taking place in January and the minimum in July. The weight gains were high in October, November, and December and low in June, July, and August, especially in July, the month of lowest basal metabolic rate.

"The coefficients of correlation between the basal heat production and the weight, height, and surface area have been calculated, using 162 sets of data, and it has been demonstrated that the weight in the case of children is the most reasonable and practical factor for expressing the basal heat production."

Survey of the physical condition of children between the ages of three and five years in Cardiff and Rhondda schools, with special reference to the factor of malnutrition, A. G. Watkins (*Brit. Med. Jour., No. 3885 (1935), pp. 1256–1260, figs. 4*).—This survey was conducted on 208 children in Cardiff, a Welch city of varied industries, and 278 in Rhondda, a coal industry center. The latter, because of its high unemployment rate, came under the official designation of a "distressed area." All of the children were in school, although the average length of attendance before the examination was only 5 mo. for the Cardiff and 6 mo. for the Rhondda children. The main points of the investigation were history of past illnesses, family history, general physical examination, height and weight measurements (in socks and underclothing only), assessment of physical condition, employment of parents, and general housing conditions.

From the results of the general physical examination, the children were classified as group A of good and group B of fair or poor condition. In the Cardiff area 88.2 percent and in the Rhondda area 91.7 percent were in group A. The higher percentage of children in apparently good nutrition in the so-called "distressed area" is thought to be accounted for to some extent by the greater opportunities for the provision of free milk.

The conditions which appeared to be the most important predisposing causes for lowered physical condition were infectious diseases (especially measles and whooping cough), unhealthy nasopharynx, and unsatisfactory housing conditions, for all of which the percentages were somewhat higher in Cardiff than in Rhondda; and respiratory diseases (especially pneumonia) and other infectious diseases (especially otitis media and sore throat), with slightly higher percentages for these in Rhondda than in Cardiff.

A division of the group B children as (1) endogenous cases in which there was clear medical evidence as a cause for poor physique, (2) economic cases where the housing and money conditions alone were abnormal, (3) mixed cases, and (4) indeterminate cases gave the following percentage distribution for Cardiff and Rhondda, respectively: (1) 41.7 and 30.5, (2) 20 and 13, (3) 16.7 and 8.7, and (4) 40 and 47.8 percent.

Two further classifications of the group B children were made, the first by subtracting the figures for the endogenous group from the total and expressing the remaining figure as a proportion of the total number of children examined, and the second by dividing the total number of children by the number of cases in which the economic factor appeared to be the only determining cause. The first of these figures is called the relative malnutrition rate and the second the basal malnutrition rate. Both of these rates were considerably lower in Rhondda than in Cardiff.

A study of the protein needs of preschool children, A. L. Daniels, M. K. Hutton, E. M. Knott, O. E. Wright, G. J. Everson, and F. Scoular (*Jour. Nutr., 9 (1935), No. 1, pp. 91–107, figs. 3*).—Following the same general procedure as in a previously noted investigation of the calcium requirements (E. S. R., 71, p. 881), the authors have attempted to determine the protein needs of children of the same age group by studying their nitrogen retentions at various levels of ingestion and evaluating the data, first, in relation to weight, both actual and theoretical, and, second, in relation to the elimination of creatinine.

"The results based on the creatinine eliminations were found to be more consistent than those by other methods tested. Interpreting the data based on creatinine elimination in terms of theoretical weight of the children studied, it is concluded that children of the ages considered should receive approximately 3.2 g of protein per kilogram (N×6.25) or 1.5 g of protein per pound in diets furnishing at least 50 percent of the protein from animal sources."

A study of the basal metabolism and diet of normal young college women in Florida, J. Tilt and C. F. Walters (*Jour. Nutr., 9 (1935), No. 1, pp. 109–117*).—An earlier study of the basal metabolism of young women at the Florida State College for Women (E. S. R., 68, p. 593) has been extended to similar observations on another group of students from 17 to 26 yr. of age. Of these, 17 were native Floridians, 13 had lived in Florida from 8 to 23 yr., and 8 had recently come from northern States. Observations were made on the northern group and on 13 of the Florida group once during the year and on the remaining 18 subjects during the fall, winter, and spring. A 4-day study of protein and calorie intake was also made on the group of 18.

For the group of 30 who had lived in Florida 8 yr. or longer, the average deviations calculated from the prediction standards were Boothby and Sandiford modification of the Aub-DuBois standard —14.1 percent and Harris-Benedict —13 percent, and for the 8 who had recently come from the north —7.7 and —7.8 percent, respectively. These figures indicate a decidedly lower metabolic rate for the southern than the northern women. The values for the southern women were also somewhat lower than those reported in the previous study.

No significant seasonal differences were noted in the basal metabolic rate, nor was there any consistent relationship between basal metabolism and protein or calorie intake. The average protein intake was 1.23 g and calorie intake 39.9 per kilogram of body weight per day.

Diurnal variations in concentration of red blood cells and hemoglobin, J. J. Short (*Jour. Lab. and Clin. Med., 20 (1935), No. 7, pp. 708–713*).—Spontaneous variations in red cell count up to 940,000 per cubic millimeter and in hemoglobin values up to 47 percent within a period of 8 hr. were observed in normal individuals engaged in their customary sedentary occupations. Less marked but sudden changes were observed in individuals subjected to active exercise such as stair running. The hemoglobin and red cell values did not always vary in the same direction at the same time. In two glucose tolerance tests, hemoglobin determinations over 2½-hr. periods showed no significant variations, thus indicating that blood dilution was not sufficient to produce appreciable variations in hemoglobin concentration.

The effect of diet upon the blood thioneine of the albino rat, V. R. Potter and K. W. Franke (*Jour. Nutr., 9 (1935), No. 1, pp. 1–10, figs. 2*).—In connection with the investigation at the South Dakota Experiment Station of the new plant toxicant noted on page 82, chemical studies were made on the blood from rats on a variety of diets. This paper reports the data obtained in determinations of uric acid and thioneine, the latter values being reported in terms of milligrams of uric acid per 100 cc of whole blood.

The thioneine values obtained on the various diets used in the general investigation were for the wheat diet 0.43±0.18 mg of uric acid, corn 0.98±0.22, 2 samples of oats 1.22 and 0.59 mg, respectively, and the stock diet 1.17±0.2 mg. of uric acid per 100 cc of blood.

The wide differences in these values, together with the fact that blood from young rats at weaning is practically free from thioneine and that the ergothioneine content of the blood of pigs varies widely with the diet, lead the authors to conclude that blood thioneine is entirely exogenous in character. If this is true, the clinical significance of blood thioneine findings, as reported in the literature, is thought to be questionable. It is considered unlikely that either methionine or glutathione is the precursor of thioneine. No suggestion is given as to its origin.

The uric acid values showed no significant differences according to diet, age, or sex. The mean value was 3.38±1.55 mg per 100 cc of blood.

Effect of diet upon blood phosphorus partition of rats with and without insulin, N. van Cleve and A. F. Morgan (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 9, pp. 1636–1641*).—Three groups of 16 rats each were placed at 28 days of age on diets designated as standard, high carbohydrate, and high fat. At the end of 28 days the animals were fasted for 24 hr., and then half of each group were given insulin in amounts of 3 units per kilogram body weight. One-half hr. after the insulin administration the pooled whole blood (collected under amytal anesthesia) from 8 rats in each group was used to determine the phosphorus in various forms and the blood sugar. The entire experiment was repeated with another series.

From the data presented the authors conclude that "after insulin injection (1) the blood inorganic phosphorus of rats decreases only on the high fat diet, (2) the other determined phosphorus fractions vary only slightly, (3) there does not appear to be a loss of phosphorus from the blood, and (4) there is a tendency for the organic phosphorus of the blood to increase."

The effect of oil of peppermint on the emptying time of the stomach, H. I. Sapoznik, R. A. Arens, J. Meyer, and H. Necheles (*Jour. Amer. Med. Assoc., 104 (1935), No. 20, pp. 1792–1794*).—Three methods were used in this study, (1) the balloon method, with records of hunger contractions, using as subjects patients with duodenal ulcers, normal students who had been without food for 12 hr., and dogs with a gastrostomy; (2) the duodenal cannula method, using a dog with a metal cannula in the stomach and another in the duodenum; and (3) the fluoroscope method, using 6 young women with no gastro-intestinal complaints.

The results with the first method were entirely negative. In the second, in three duplicate tests with meat and water alone and with 2 cc of oil of peppermint, the emptying time of the stomach was decreased from 3½ hr. to 2½ hr. by the oil of peppermint. In the fluoroscope tests, the addition of 2 cc of oil of peppermint to a barium-milk meal shortened the emptying time of the stomach from an average of 249 min. to 143 min. Similar decreases in the emptying time were induced by the consumption of peppermint candy or an alcohol solution of peppermint oil.

These findings are thought to explain the popular use of oil of peppermint alone or as a constituent of a number of official and proprietary stomach remedies, as well as to justify the popular custom of serving peppermint candy or peppermint cordial after dinner. The habit is thought to be especially useful after a heavy meal with high fat content which delays the emptying of the stomach.

[Vitamin studies by the Alabama Station] (*Alabama Sta. Rpt. 1934, pp. 20–23.*)—This progress report (E. S. R., 73, p. 132) includes summaries of studies by W. D. Salmon and J. G. Goodman on the effect of fats and of individual esters upon the vitamin B requirement of rats, and by G. A. Schrader on the quantity of glycogen in the vitamin B-deficient rat and its ability to deplete this glycogen during starvation, on the ability of the vitamin B-deficient rat to utilize *d*-lactic acid, and on the apparent ability of the vitamin B-deficient rat to transform carbohydrate into fat.

[Vitamin studies] (*Idaho Sta. Bul. 217 (1935), pp. 30, 31*).—Progress reports are given on a continuation of studies on the vitamin A content of forage crops (E. S. R., 69, p. 412) and on a new study of the vitamin C content of fresh and stored Italian prunes.

Observations on the absorption of carotene and vitamin A, J. C. Drummond, M. E. Bell, and E. T. Palmer (*Brit. Med. Jour., No. 3884 (1935), pp. 1208–1210, fig. 1*).—The opportunity of studying the absorption of vitamin A and carotene by way of the chyle was afforded in a case of chylothorax necessitating the withdrawal of fluid diverted into the pleural cavities from the thoracic duct. When carotene was administered orally a relatively small portion of it could be accounted for by the pigment in the chylous fluid, but when vitamin A was administered as a tablet concentrate in amounts furnishing approximately 125 mg of the vitamin, the recovery was such as to indicate almost complete absorption.

Further examination of the fluid showed that neither carotene nor vitamin A was present in diffusible form but rather in colloidal form closely associated with the highly dispersed fat. As vitamin A was administered as the free alcohol and found in lymph mainly in the esterified condition, it is concluded that esterification takes place during absorption. "It is not unlikely, therefore, that the facilities of absorption which the possibility of esterification of the alcohol grouping of vitamin A permits account for the relatively much larger proportion of this substance than of carotene which appeared in the lymph after oral administration."

A synthetic vitamin A-free milk suitable for vitamin A studies in very young puppies, W. O. Frohring (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 7, pp. 1021–1024, figs. 3*).—A synthetic milk corresponding in chemical composition to bitch's milk has been found very satisfactory as a basal diet for vitamin A studies on young puppies, and is suggested for studies on vitamins B, G, and D as well. The milk is prepared from the following ingredients: Vitamin A-free soluble casein 110, Crisco 95, sucrose 30, Osborne and Mendel salt mixture 7.5, and linoleic acid 1 part, with tap water to make 1,000 lb. The mixture is homogenized at 3,000 lb. pressure, placed in hermetically sealed cans, and sterilized in the same manner as evaporated milk. A supplement of dried brewer's yeast as a source of the B complex and of irradiated baker's yeast as a source of vitamin D is added to the mixture before feeding.

Vitamin B_1 and B_2 content of human urine, O. M. Helmer (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 7, pp. 1187, 1188*).—Twenty-four-hour samples of urine collected from 3 normal subjects on a weighed well-balanced diet of 2,750 calories, selected to furnish adequate amounts of vitamins B_1 and B_2, and a similar sample from 1 patient with untreated pellagra were concentrated by vacuum distillation, dried in vacuo over H_2SO_4, mixed with 1 part by weight of sucrose and ½ part by weight of Crisco and fed to rats on a basal diet deficient in both vitamins in quantities equivalent to ⅛ of the 24-hr. sample. In the vitamin B_1 tests, 500 mg of autoclaved yeast was fed as the source of vitamin B_2, and in the B_2 tests an extract of rice polishings, prepared as described by Rosedale (E. S. R., 58, p. 894), was used.

At the end of the experimental period of from 20 to 49 days, the rats fed the normal urine as a source of either B_1 or B_2 were in good condition, with some gain in weight, while the rats fed urine from the pellagra patient were dead or in a dying condition, although in one case substantial gains in weight had been made.

The author is of the opinion that similar determinations of the vitamin B_1 and B_2 content of human urine may provide a means of studying the physiology of these vitamins and of determining the human dietary requirement for them.

The study was conducted with the assistance of M. R. Richardson and M. Wheeler.

Value of increased supply of vitamin B_1 and iron in the diet of children, II, J. R. Ross and P. Summerfeldt (*Amer. Jour. Diseases Children, 49 (1935), No. 5, pp. 1185–1188, figs. 2*).—In this continuation of the study noted previously (E. S. R., 67, p. 484), further evidence along similar lines over a longer period is reported on the growth-promoting properties of the special cereal mixture devised by Tisdall and associates.

In one group of children given a vitamin B supplement in addition to a good diet an increase in weight 1.6 times the expected increase was produced over a period of 6 mo. During the same time, the substitution of 3 oz. of the special cereal mixture for 3 oz. of ordinary cereal produced an increase in weight 2.3 times the expected. A group of children on the institution diet without supplement showed during the same period an increase in hemoglobin content of the blood from 10.4 to 10.7 g per 100 cc, the children receiving the vitamin B supplement from 10.1 to 11 g, and those receiving the special cereal mixture from 10.2 to 12 g.

These findings are thought to indicate that the gain in weight of the children fed the special cereal cannot be due entirely to its vitamin B content, as suggested in the earlier paper. "What other factors in the special cereal mixture not present in ordinary cereal are responsible for the greater gain in weight of this group is not clear. It is possible that the rich mineral content or the increased ease of digestibility of the cereal mixture may be of significance."

Avitaminosis B_2, J. V. Landor and R. A. Pallister (*Roy. Soc. Trop. Med. and Hyg. Trans., 29 (1935), No. 2, pp. 121–134, pls. 2*).—The authors describe a disease resembling but not identical with pellagra which occurs widely among inmates of prisons and other institutions and sporadically among the general public in Malaya and is cured or prevented by materials rich in vitamin B_2, particularly liver and marmite. The disease has an early stage characterised by eczema of the scrotum and angles of the mouth and superficial glossitis and a late stage in which the symptoms are those of combined degeneration of the cord and poor vision. Various reports in the literature are cited to show that symptoms of this type are wide-spread throughout the world. As some of the symptoms of pellagra, such as dermatitis of the hands and feet, were not present in the cases studied, the authors prefer to call the condition avitaminosis B_2 rather than pellagra.

The prison diets on which the disease was contracted were on the whole carefully planned to provide a sufficiency of vitamins, and there were no cases of beriberi among the prisoners.

The vitamin C content of the Russet Burbank potato of Idaho, E. Woods (*Idaho Sta. Bul. 219 (1936), pp. 29, figs. 6*).—New, mature, and stored potatoes of the Russet Burbank variety, commonly known as Netted Gem, from four consecutive crops grown for the most part under irrigation on the university farm or at the Aberdeen Substation were boiled for a definite period of time and then riced and fed immediately to guinea pigs on a vitamin C-free diet. The new potatoes were taken from growing vines and were immature. The mature samples were such as are regularly stored for winter use and were used the first 8 weeks after digging. The stored samples were mature potatoes kept in the vegetable storage house under conditions approximating storage on the farm. In a few instances some were removed from the storage house and kept at room temperature and others in the refrigerator for 10 days before being fed.

The animals receiving 1 g daily of the boiled immature potatoes lived through the 60-day test period and made some gains in weight, but the average scurvy score was as high as for the negative controls. Increased doses up to 8 g gave better growth and lower scurvy scores, but beyond this amount the changes were small. The mature potatoes fed at the same levels as the new immature ones gave less satisfactory results. In both gain in weight and decrease in scurvy score 8 g of the mature potatoes gave no more favorable results than 4 of the new potatoes. Potatoes stored from 3 to 8 mo. gave somewhat inconsistent results. In the 4-yr. averages the animals receiving 4 g of potatoes stored from 3 to 5 mo. did not grow quite as well as those receiving the same amount of the fresh mature potatoes. The scurvy scores were also somewhat higher. At a 16-g level of feeding the growth was less, but at the same time the scurvy score was lower. Potatoes which had sprouted gave somewhat better growth and lower scurvy scores than the stored nonsprouted samples. Stored potatoes kept for a short time in the refrigerator gave losses rather than gains in weight, but the numbers were too few to warrant definite conclusions.

In all of the separate tests where any considerable numbers of animals were included in a group, no doses used completely protected all of the animals of the group. The author concludes that potatoes may suffice as a source of vitamin C in the diet in an emergency, but should be supplemented with other sources of vitamin C for best health and development.

The report contains a bibliography of 20 titles and tabulated data on the individual weight and scurvy records of the experimental animals.

The vitamin C content of Chinese foods and drugs, Y. F. CHI and B. E. READ (*Chinese Jour. Physiol., 9 (1935), No. 1, pp. 47–62*).—Determinations of the vitamin C content of 120 Chinese foods and drugs have been made with microchemical methods, using iodine titration, the 2,6-dichlorophenolindophenol method of Tillmans et al. (E. S. R., 69, p. 8) and the Harris and Ray modification of the latter method (E. S. R., 70, p. 426), and with the juice of fresh lemons as a standard, as described by Bessey and King (E. S. R., 71, p. 137). With materials giving too low values in comparison with known biological values in the Harris method, preliminary treatment with hydrogen sulfide was followed, with higher results in most instances. In other cases the Emmerie technic of mercuric acetate treatment to remove cysteine was used. Various methods were employed to remove interfering pigments.

The values obtained are tabulated by type of material, as citrus fruits, cucurbits, roots and tubers, legumes, leaves and stems of vegetables and drugs (fresh), fruits, and animal foods. For each item, the information given includes the English and botanical or varietal name, content of ascorbic acid by the Harris and iodometric methods, qualitative vitamin C values in + signs, and notes concerning special treatment or further description of the samples.

Among the citrus fruits tested, one sample of pomelo (Siam) gave the highest value, 0.74 mg per cubic centimeter of juice, by the Harris method, as compared with 0.51 mg for a sample of fresh Sunkist orange and 0.52 mg for grapefruit (U. S. A.).

In the cucurbits the vitamin C is thought to exist in an oxidized form reducible by H_2S, for higher values were obtained by the Harris method after treatment with H_2S. Among the roots and tubers kohlrabi gave the best results, 0.69 mg per gram. The values for carrot were so low that a 0 qualitative value for vitamin C was assigned to it as well as to ginger root and the waterchestnut. Low values were found for all the legumes tested with the exception of green peas, 0.24 mg per gram.

Among the fruits, *Capsicum* and mango gave highest values, 0.65 and 0.59 mg per gram, and apricots, pears, loquats, and plums values so low that 0 values were assigned. Strawberries had even higher values than mangoes by the iodometric test but were not tested by the Harris method.

The animal foods tested, which included duck-egg yolk and white, prawns, shrimps, clams, liver of different species, pig kidney, and chicken gizzard, showed such discrepancies between the iodine and Harris values that it was concluded that the group needs special methods of removal of other reducing substances.

The group of leaves and stems of vegetables and fresh drug plants gave some very interesting results in view of the use of some of them in old medical practice in China for conditions suggestive of vitamin C deficiency. Among these were the leaves of willow, 1.25 mg per gram, poplar 0.58, tea (fresh) 1.05, shepherd's purse 0.4, Chinese nasturtium 0.56, Chinese iris 1.1, and dandelion 0.42 mg per gram. Other leaves in this group with high values were alfalfa 0.9, mustard 0.81, and rape 0.51 mg per gram. Of our common green leafy vegetables, cabbage sprouts contained 0.5, kale 0.34, lettuce 0.042, plantain 0.12, purslane 0.08, and spinach 0.84 mg per gram.

The authors conclude as a result of this investigation that, compared with such biological values as are known, the microchemical tests produce reliable results closely approximating their true antiscorbutic potency.

Total ascorbic acid content of human blood, I. A. MIRSKY, S. SWADESH, and S. SOSKIN (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 7, pp. 1130, 1131*).—Using, in the method of Emmerie and Van Eekelen (E. S. R., 73, p. 583), 5 cc instead of 10 cc of blood and acetic acid instead of trichloroacetic acid for the final titration, the authors have determined the ascorbic acid content of blood in the post-absorptive state of about 100 individuals, including normal subjects and patients suffering from a variety of chronic diseases.

The ascorbic acid values for the apparently normal individuals ranged from 1.19 to 2.66 mg percent and for those with chronic diseases from 1.11 to 2.88 mg percent. No correlation was apparent between the diseases investigated and the ascorbic acid values, although cases of coronary sclerosis were almost uniformly in the upper limits.

Ascorbic acid content of blood, C. J. FARMER and A. F. ABT (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 9, pp. 1625–1629*).—A method of determining small amounts of ascorbic acid in blood plasma is described, and data are reported on its use both in demonstrating the recovery of added ascorbic acid and in determining the content of ascorbic acid in the blood of a group of medical students before and after the consumption of 1 pint of orange juice daily for 1 week and in a group of children selected at random from those attending a pediatric clinic.

In the method as described, 5 cc or more of blood is drawn, oxalated, centrifuged immediately, the plasma removed, and a tungstic acid filtrate prepared. After the liquid has been centrifuged, 2 cc portions are pipetted into round-bottom centrifuge tubes and titrated immediately to the first pink color, using a 5 cc microburette to measure the required volume of dye solution. The dye used is sodium 2,6-dichlorobenzenoneindophenol, the solution of which is standardized against ascorbic acid, which is further checked by titration with N/100 iodine solution previously standardized against potassium iodate.

The data presented show a very definite relation between the ascorbic acid in reduced form in the blood and the vitamin C intake. Attention is called to the failure of Mirsky et al., noted above, to find any correlation between the total ascorbic acid of the blood and the dietary regime, and the conclusion is drawn that for clinical purposes the reduced ascorbic acid content of the blood is of the greater significance.

Biological formation of ascorbic acid, B. C. Guha and A. R. Ghosh (*Nature [London], 135 (1935), No. 3406, p. 234*).—In continuation of attempts to synthesize vitamin C in vitro (E. S. R., 73, p. 727), rabbit and pigeon tissues have been found to give positive, and monkey and guinea pig tissues (normal and scorbutic) negative, results when incubated with mannose at pH 7.4 for 3 hr. at 37° C. Other sugars gave negative results with the exception that pigeon-liver tissue was able to convert glucose into ascorbic acid. Preliminary experiments indicated the possibility that ascorbic acid might also be produced by prolonged incubation of glucose with the liver tissue of the rat.

Biological synthesis of ascorbic acid, B. C. Guha and A. R. Ghosh (*Nature [London], 135 (1935), No. 3421, p. 871*).—The in vitro experimental synthesis of ascorbic acid by the action of mannose on rat tissue, as noted above, has been confirmed by in vivo experiments in which the intravenous injection of mannose into rats has been followed by a rise in the ascorbic acid content of the adrenals, the small intestines, kidney, and liver. Similar results were obtained when the mannose was injected subcutaneously, and a slight increase in the ascorbic acid content of the adrenals was induced by the intravenous injection of glucose.

Preliminary experiments are also noted in which embryonic guinea pig tissue at an early stage of development, ovarian tissue of the pregnant guinea pig, and ovarian tissue of the adult nonpregnant monkey proved capable of converting mannose into ascorbic acid in vitro on incubation for 4 hr. at pH 7.4 in a mixture of phosphate buffer and Ringer-Locke solution at 37° C. The guinea pig embryo apparently loses this property gradually with its development.

"The above observations (especially those with the intravenous injection of glucose) indicate that while glucose is the ultimate precursor of ascorbic acid, it has probably to pass through the intermediary stage of mannose or some mannoselike configuration."

Comparison of oral and subcutaneous administration of protective doses of ascorbic acid (vitamin C), H. C. Hou (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 9, pp. 1391, 1392*).—In this preliminary report it is noted that the degree of protection against scurvy, graded according to the method of Key and Elphick (E. S. R., 67, p. 189), of 9 guinea pigs receiving ascorbic acid by mouth was on the average exactly one-half that of the same number of guinea pigs receiving the ascorbic acid by subcutaneous injection. It is thought that this may indicate that part of the ascorbic acid given orally is lost in the alimentary tract.

Vitamin C and diphtheria toxin, C. K. Greenwald and E. Harde (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 7, pp. 1157–1160*).—Earlier studies in which freshly prepared highly labile diphtheria toxin was used (E. S. R., 72, p. 886) have been repeated with a standardized stable toxin. Two different actions were studied—(1) the effect on resistance to diphtheria toxin by guinea pigs of preliminary feeding of excess vitamin C and of subcutaneous or intravenous injection of the vitamin and (2) the action in vitro of the vitamin on the toxin, antitoxin, and mixtures of the two.

In the first series of experiments no increased resistance to diphtheria toxin was shown by the animals receiving vitamin C, but on repeating the feeding tests and using great care in handling the animals some protection was shown. In the in vitro tests, 10 mg of the vitamin per M. L. D. of toxin was found to neutralize the toxin, while partial protection was secured with increased doses of toxin treated with the vitamin in the same proportion. The vitamin was found to have no harmful effect on standard antitoxin and to neutralize the toxin in the toxin-antitoxin mixtures. In a final experiment, the unneutralized vitamin added to standardized toxin in the proportion of 1 mg to 3½ M. L. D. afforded complete protection.

It is noted that only clinical work can determine whether the increased resistance to diphtheria toxin shown by guinea pigs treated with vitamin C can be applied to human beings.

Inactivation of diphtheria toxin in vivo and in vitro by crystalline vitamin C (ascorbic acid), C. W. JUNGEBLUT and R. L. ZWEMER (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 8, pp. 1229–1234*).—The implication of the adrenal gland in diphtheria and the association of vitamin C with the adrenal gland led to this investigation of the effect of vitamin C on diphtheria toxin. In the first series of studies varying quantities (0.05 to 100 mg) of vitamin C as Cebione in solutions adjusted to pH 6.6 to 6.8 were combined with 2 M. L. D. of diphtheria toxin and, after standing ½ hr. at room temperature, were injected subcutaneously into guinea pigs. There appeared to be a very definite and limited range of vitamin C content (0.5 to 5 mg) within which this dosage of diphtheria toxin was neutralized.

In the second series guinea pigs were injected with 2 M. L. D. of diphtheria toxin and at the same time were given a separate subcutaneous injection of different amounts (1 to 200 mg) of vitamin C in acid solution. About half of the animals which had received 5 mg or over of the vitamin survived.

In a third and final series guinea pigs were allowed to store vitamin C by daily injections for 6 days and then given minute doses of diphtheria toxin by intracutaneous injections in four doses, two on a side. The storage of vitamin C either inhibited or completely suppressed the local reaction to the toxin, the protection being somewhat proportional to the dosage.

It is concluded that vitamin C plays an important part in the natural resistance to diphtheria toxin.

Urinary excretion of vitamin C in pneumonia, E. HARDE, I. A. ROTHSTEIN, and H. D. RATISH (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 7, pp. 1088–1090*).—The urinary excretion of vitamin C was followed in 10 cases of pneumonia, in 5 of which saturation tests were made. The technic of Harris and Ray (E. S. R., 73, p. 427) was followed as closely as possible. On account of the impossibility of getting complete 24-hr. specimens of the urine, the results are considered only suggestive.

In the 5 cases in which no saturation test was made, only 2 definitely low values were obtained. In 4 of the other cases the immediate saturation tests were negative (no increase in excretion following the saturation test). In the fifth the saturation tests were negative until the tenth day, when a total of 95 mg ascorbic acid was excreted in 16 hr. "We have thus found, in accord with Harris and Ray, that by the saturation test a hypovitaminosis may be shown even though the titration of the urine alone might give normal values. Whether the deficiencies in the vitamin we have found in certain cases are due to the previous diet of the patients or to the intoxication of the pneumonia or to both factors we have not yet determined. We also note that certain of the lesions of the cardiovascular system in pneumonia suggest those found in scorbutic conditions."

The adrenaline content of the suprarenal glands in scurvy and in inanition, W. Deutsch and W. Schlapp (*Jour. Physiol., 83 (1935), No. 4, pp. 478–482, figs. 3*).—A comparison of the content of adrenalin and of ascorbic acid in the adrenal glands of guinea pigs in scurvy and in severe inanition showed a lowered content of adrenalin in both conditions, but no decrease in ascorbic acid in the animals suffering from inanition but receiving sufficient green food. It is concluded that there is no close relationship between ascorbic acid and adrenalin.

Dermal absorption of vitamin D, P. S. Astrowe and R. A. Morgen (*Amer. Jour. Diseases Children, 49 (1935), No. 4, pp. 912–922, figs. 8*).—Viosterol applied in large doses to the unbroken depilated skin of rats proved capable of curing and preventing rickets. The action appeared to be by direct molecular absorption rather than by secondary irradiation and to be independent of the source of the viosterol. No harmful effects were produced by the large doses used.

Treatment by diet, C. J. Barborka (*Philadelphia and London: J. B. Lippincott Co., 1934, pp. XII+615, [pls. 8]*).—The purpose of this volume is "first, to present to physicians a concise, practical, and systematic method of prescribing diets and applying treatment by diet to health and disease; second, to aid the physician and dietitian in teaching the individual patient how to make a selection of the proper amount and type of food that has been prescribed for him."

Part I contains a brief discussion of the essential requirements of a normal diet; a concise tabulation of the functions, clinical features of deficiency or absence, and relative distribution in foods of the various vitamins; and a typical diet for an average normal adult in terms of total food allowance and suggested distribution of food for one day. Part 2, on the application of dietotherapy, is devoted to instruction on measured diets, with weights, measures, and photographic illustrations of relative size of comparative servings of the different types of food. Part 3, constituting the greater portion of the volume, deals with diet in (1) diseases in which diet is of paramount importance, and (2) conditions in which diet is of varying importance. The plan followed for each disease is to give a brief definition of the nature of the disease and the object of the diet and then to discuss more fully the important factors in the dietary treatment, and to give directions for the application of the diets, with illustrations from typical diets and menus for one day. Part 4 consists of a short section on hospital diets, and part 5 is an appendix containing a few essential tables and specific recipes. An extensive bibliography and a very complete subject index complete the volume.

A comparison of "yeast milk" and irradiated milk in the treatment of infantile rickets, E. T. Wyman, R. C. Eley, J. W. M. Bunker, and R. S. Harris (*New England Jour. Med., 212 (1935), No. 6, pp. 256–262, figs. 9*).—In this comparison, irradiated milk and yeast milk from a special herd of dairy cattle fed irradiated yeast in amounts calculated to produce a vitamin D milk of 50 rat units per quart were tested biologically at frequent intervals during the 12 weeks of clinical investigation, during which the two forms of milk were given to a small group of rachitic children in amounts furnishing the same quantities of vitamin D in rat units. Frequent roentgenograms were taken, and serum calcium and phosphorus determinations made. No differences in effectiveness of the two types of milk were observed. On plotting the Ca: P ratios against time, progressive increases, with the same general trends, were shown for both groups.

Studies of incurable rickets.—II, Rôle of the "local factor" and of viosterol in the pathogenesis of rickets due to beryllium, A. E. Sobel, A. R. Goldfarb, and B. Kramer (*Jour. Biol. Chem., 108 (1935), No. 2, pp. 395–401*).—Evidence is presented that the bones of rats suffering from beryllium rickets behave in the same way as those of rats suffering from strontium rickets, as noted in the first paper of the series (E. S. R., 71, p. 730), in failing to calcify when incubated in a suitable artificial serum. The bones of rats receiving viosterol as a supplement to beryllium likewise failed to calcify in vitro, although the viosterol caused a rise in the Ca×P product in the serum.

"Mottling of enamel" effected by a single fluorine dose, S. Loewe and H. Salfeld (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 9, pp. 1649–1651*).—In a preliminary series of experiments on 20 young rats it has been demonstrated that a single dose of fluorine administered by stomach tube is capable of evoking irreversible changes in the enamel of the incisors, presumably by inhibiting a phosphatase action necessary for the process of calcification. It is noted that this effect is similar to the effects of intermittent subcutaneous injections of fluorine, as reported by Smith (E. S. R., 73, p. 718).

"Acute and chronic fluorine action differ only in the extensiveness of the effect and in the effectiveness of the dosage. Single administration causes a single lesion, repeated administration produces mottling. The minimal single dose that may possibly produce an effect is yet to be determined; the very low daily dose invariably effective in chronic experiments fails to produce macroscopically detectable injuries, if administered only once. The larger single dose necessary to produce enamel injury also causes general effects. The high selectivity (i. e., the absence of other detectable symptoms) of the enamel mottling action in chronic fluorine administration is not encountered in acute experiments."

TEXTILES AND CLOTHING

Blankets vary widely in desirable properties, various tests indicate, M. B. Hays (*U. S. Dept. Agr. Yearbook 1935, pp. 138–140*).—Tabulated data are given on some of the physical properties of 30 blankets, including 11 of wool, 10 wool and cotton (household), 4 cotton, and 5 wool and cotton (camp) construction. The data include weight per square yard, thickness, thread count in warp and filling, breaking strength of filling by the grab method, heat transmission in calories per degree C. per second per square foot, and air permeability in cubic feet per minute per square foot per pound pressure difference.

The heat transmission varied greatly for the samples within each group, as well as from group to group. The lowest value, 0.057 calorie, was for one of the all wool and the highest, 0.142 calorie, for one of the wool and cotton household blankets. The air permeability value, which is an indication of the protection a blanket may afford in a drafty place or out of doors, also varied widely. The lowest value, 44 cu. ft., was found in 2 of the camp blankets and the highest, 176 cu. ft., in one of the wool and cotton household blankets. Breaking strength values ranged from a low of 4.6 lb. to a high of 60.2 lb., both these extremes being in the group of wool and cotton household blankets. The weights ranged from 4.6 oz. per square yard for one of the cotton blankets to 19.1 oz. for one of the camp blankets. In the wool blankets the range was from 8.4 to 14.9 oz. It is noted that a desirable all wool blanket should have a minimum weight of 12 oz. per square yard. Only 6 of the all wool blankets examined reached this minimum.

HOME MANAGEMENT AND EQUIPMENT

A food budget for Vermont farm families, D. EMERY (*Vermont Sta. Bul. 393* (*1935*), *pp. 24*).—The food budget presented in this bulletin is based upon the adequate diet at moderate cost of Stiebeling and Ward (E. S. R., 70, p. 416). The specific foods selected include those habitually used in the State, as many home-grown ones as practicable, and relatively inexpensive ones for purchase whenever possible. As an aid in selection, information concerning home production of foods, including harvest and storage dates of fruits and vegetables, was secured from the State extension service and is presented in tabular form. The food budget is presented in quantities required for 1 yr. by age and sex groups, with indication as to whether the items are to be purchased or should be produced at home. To illustrate the planning of a detailed food budget for a specific family, a sample budget is presented for a hypothetical family of husband, wife, and two children.

In order to determine the cost of the purchased foods appearing in the quantity budget, relative prices were obtained on the fifteenth of each month during 1934 from three sections of the State, in each of which the information was secured from various types of stores in communities varying in size from two isolated villages of less than 500 population to a city of 10,000 or more. The prices thus obtained were weighted according to the net sales of each type of store.

Suggestions are given for bringing up to date at any time the prices used in the budget presented by using the index numbers of the U. S. Bureau of Labor Statistics for the cost of food in the United States for the current year.

MISCELLANEOUS

Yearbook of Agriculture, 1935, H. A. WALLACE ET AL. (*U. S. Dept. Agr. Yearbook 1935, pp. IV+762, figs. 76*).—This contains a discussion of The Year in Agriculture (pp. 1–109) as the Secretary's report to the President, nearly 100 brief articles under the general title of What's New in Agriculture and noted elsewhere in this issue, and agricultural statistics noted on page 120.

Forty-fifth Annual Report [of Alabama Station], 1934, M. J. FUNCHESS ET AL. (*Alabama Sta. Rpt. 1934, pp. 30, fig. 1*).—The experimental work reported is for the most part referred to elsewhere in this issue.

Annual report of the director [of the Delaware Station] for the fiscal year ending June 30, 1934, C. A. MCCUE ET AL. (*Delaware Sta. Bul. 192* (*1935*), *pp. 51, figs. 2*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Science aids Idaho farmers: The Annual Report of the [Idaho] Experiment Station for the year ending December 31, 1934, E. J. IDDINGS (*Idaho Sta. Bul. 217* (*1935*), *pp. 56, figs. 2*).—The experimental work not previously reported is for the most part noted elsewhere in this issue. A note is also given on a new vacuum tube potentiometer for use in determining pH with the glass electrode.

Minnesota Agricultural Experiment Station, 1885–1935, A. BOSS ET AL. (*Minnesota Sta. Bul. 319* (*1935*), *pp. 78, figs. 14*).—This historical account has been previously referred to (E. S. R., 73, p. 146). Most of the specific findings are referred to elsewhere in this issue.

Fifty-sixth Annual Report of the North Carolina Agricultural Experiment Station, [1933], R. Y. WINTERS ET AL. (*North Carolina Sta. Rpt. 1933, pp. 89*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Abstracts of Bulletins 489–502, Circulars 69–72, and other publications during 1934, A. D. Jackson (*Texas Sta. Circ. 76* (*1934*), *pp. 28*).—In addition to abstracts of the station's own publications as indicated, this circular contains abstracts of articles contributed by members of the staff for publication elsewhere. For the most part these are previously noted or abstracted elsewhere in this issue, but abstracts of articles entitled Pyrethrum, a Host for *Phymatotrichum* Root Rot, by J. J. Taubenhaus and H. B. Parks (p. 20); A Dairy Sire Progeny Test, by B. L. Warwick and O. C. Copeland (p. 20); and Using Soda Straws in Hybridizing Cotton, by J. O. Beasley (p. 22), are also included.

Forty-eighth Annual Report [of Vermont Station, 1935], J. L. Hills (*Vermont Sta. Bul. 396* (*1935*), *pp. 31, figs. 3*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue. Herd improvement data are also included (pp. 13–16).

Dictionary of terms relating to agriculture, horticulture, forestry, cattle breeding, dairy industry, and apiculture in English, French, German, and Dutch, compiled by T. J. Bezemer (*Baltimore: Williams & Wilkins Co., 1935, pp. VII+ [1062]*).—This dictionary, prepared at the State Agricultural College at Wageningen, Netherlands, and published under the auspices of that institution, deals with over 10,000 terms and their English, French, German, and Dutch equivalents.

Research: The pathfinder of science and industry, T. A. Boyd (*New York and London: D. Appleton-Century Co., 1935, pp. XV+319*).—This book discusses, in an illuminating way, pure and applied research, the research method, training, recruiting, and qualifications for research, and some of the achievements of scientific research, especially as applied to industry.

Of achievements in agricultural research, the author says: "In agriculture, research has taught us, as H. G. Wells said, 'so to fertilize the soil as to produce quadruple and quintuple the crops got from the same area in the seventeenth century.' Another great aid to this increase was the breeding of better plants based upon the knowledge of the laws of heredity in plants, which knowledge grew out of the pioneer work of Abbot G. J. Mendel. . . . It is because of what his research, and all that done by subsequent investigators, has taught us about heredity and selection in plants, and in animals as well, that, as Arthur D. Little says, 'the cotton spinner has better grades of cotton; the beets coming to the refinery carry 18 percent of sugar instead of 6 percent; tobacco plants grow 30 percent more leaves fit for wrappers; wheat has more gluten, corn and potatoes more starch; hogs are heavier, cattle bigger, and hides larger and better.'"

NOTES

Alabama Station.—The 1935 legislature has provided an increase of $46,000 per annum for the maintenance of the station program, together with $100,000 for additions to the physical plant at the branch stations and experiment fields.

Massachusetts Station.—Charles R. Creek, FERA supervisor of rural research at Purdue University, has been appointed assistant research professor in the station department of agricultural economics and farm management.

Pennsylvania College and Station.—Dr. Pauline Beery Mack, associate professor of chemistry in the school of chemistry and physics, has been appointed director of home economics research. The department of home economics remains in the school of education, but Dr. Mack will direct the research program of the department in cooperation with the station.

Association of Land-Grant Colleges and Universities.—In addition to the general officers enumerated on page 3, the following section officers were elected at the Washington meeting, November 18–20, 1935: Agriculture, H. W. Mumford of Illinois, chairman, R. L. Watts of Pennsylvania, vice chairman, and William Peterson of Utah, secretary; engineering, R. L. Wales of Rhode Island, chairman, and H. B. Dirks of Michigan, secretary; and home economics, Alba Bales of North Dakota, chairman, and Edna L. Skinner of Massachusetts, secretary. In the section of agriculture, the subsection of experiment station work elected A. B. Conner of Texas, chairman, and C. E. Ladd of New York, secretary; the subsection of extension work, J. C. Taylor of Montana, chairman, and J. R. Hutcheson of Virginia, secretary; and the subsection of resident teaching, L. J. Horlacher of Kentucky, chairman, and V. C. Freeman of Indiana, secretary.

A number of changes were made in the committees and their personnel. For extension organization and policy a single committee was reestablished, with R. K. Bliss of Iowa as chairman and the following new members for 3 yr.: C. A. McCue of Delaware, W. H. Brokaw of Nebraska, and Lurline Collier of Georgia. H. H. Williamson of Texas replaced O. B. Martin for a 1-yr. term. The committee on experiment station organization and policy enlarged its membership by naming J. T. Jardine, Chief of the Office of Experiment Stations, as an ex officio member and appointing in his stead L. E. Call of Kansas for 1 yr. C. B. Hutchison of California and M. J. Funchess of Alabama succeeded E. A. Burnett of Nebraska and C. L. Christensen of Wisconsin for 3-yr. terms, and Director Funchess was made chairman. Other changes included the following appointments: College organization and policy, A. A. Hauck of Maine for 1 yr. vice C. C. McCracken of Connecticut and C. S. Boucher of West Virginia for 3 yr. vice J. J. Tigert of Florida; agriculture I. L. Baldwin of Wisconsin vice P. W. Chapman of Georgia; instruction in engineering, G. W. Case of New Hampshire and F. C. Bolton of Texas vice C. Derleth, Jr., of California and S. B. Earle of South Carolina; instruction in home economics, Ava B. Milam of Oregon and Mildred F. Horton of Texas vice Edith P. Chace of Pennsylvania and Mildred P. French of Connecticut; radio, W. Newell of Florida and F. M. Hunter of Oregon vice E. A. Hitchcock of Ohio and E. Bennett of Wisconsin. The joint committee on projects and correlation of research was reconstituted by the replacement of A. R. Mann of New York by W. C. Coffey of Minnesota and F. D. Richey and L. A. Strong of the U. S. Department of Agriculture by O. E. Reed and A. G. Black. No change was made in the joint committee on publication of research, the special committee on land-grant institutions for negroes, or the special committee on land problems.

Association of Official Agricultural Chemists.—Registration at the fifty-first meeting of this association, held in Washington, D. C., November 11–13, 1935, reached 425, exceeding all previous records.

The address of the president, Dr. F. C. Blanck of the U. S. D. A. Bureau of Chemistry and Soils, was entitled Science and Our Food Industries. Dr. Blanck regarded chemical research as fundamental to such food industries as canning, meat packing, and baking. Among other fields in which investigation is much needed he cited enzymes and their relation to the preparation and spoilage of foods and the effect of light on food preservation.

The Fifth Wiley Memorial Address was given by Dr. W. H. MacIntire of the Tennessee Experiment Station, who took for his subject Certain Practical Aspects of Soil Chemistry Research. Dr. MacIntire paid special tribute to Dr. Wiley for his interest in soil chemistry and reviewed the development of the subject, including its relations to fertilizers and along biochemical lines.

Officers elected for the ensuing year included H. H. Hanson of the Delaware State Board of Agriculture as president; C. C. McDonnell, U. S. D. A. Food and Drug Administration, as vice president; W. W. Skinner, U. S. D. A. Bureau of Chemistry and Soils, as secretary-treasurer; and C. L. Hare, Alabama Polytechnic Institute, as a member of the executive committee.

Association of American Feed Control Officials, Incorporated.—The twenty-seventh annual convention of this association was held in Washington, D. C., November 14 and 15, 1935. The address of the president, W. B. Griem, dealt especially with the proposed uniform feed law. This measure formed the principal topic of discussion, and a draft for submission to State legislatures was tentatively agreed upon. The vice president, C. E. Buchanan of Topeka, Kans., was elected president for the ensuing year, and L. S. Walker of the Vermont Experiment Station, vice president. L. E. Bopst of the University of Maryland was reelected secretary-treasurer.

New Journals.—*Land Policy Review* is being issued monthly by the land policy section, Division of Program Planning, U. S. D. A. Agricultural Adjustment Administration. "In it will be summarized current developments in the field of land research, planning, and policy. Most items will be brief, although occasionally longer articles dealing with important phases of land use will be included. Information will be supplied concerning progress of the submarginal land acquisition program, land-use research, and active programs of agricultural experiment stations, State planning boards, and other agencies and groups whose activities have a definite bearing on problems and policies of agricultural adjustment."

The Journal of South African Botany is being published quarterly by the National Botanic Gardens of South Africa from its office at Kirstenbosch, Newlands, Cape of Good Hope, as "a medium for the publication of work on the South African flora, whether systematic, ecological, morphological, or otherwise, and whether carried out in South Africa or in other countries; and also on botanical subjects of special interest and application in South Africa." In addition to book reviews, the initial number contains an article on *Freesia* Klatt and Its History, by N. E. Brown (pp. 1–31), and one entitled Plantae Novae Africana, by W. F. Barker et al. (pp. 32–39).

Revista Argentina de Agronomía is being published at approximately bimonthly intervals as the organ of the Argentine Society of Agronomy, Buenos Aires. Its primary purpose will be the publication of technical articles. The initial number reprints Mendel's classic article on Hybrids in Plants (pp. 2–38), and presents Method of Direct Observation of the Soil

Microflora and Microfauna in a Moist Chamber, by S. Soriano (pp. 39–51); New Descriptive Data on the Cultivation of Maize in Pre-Spanish Peru, by H. Greslebin (pp. 52–65); and Observations on Normal Meiosis in a Case of Asynapsis in *Sisyrinchium*, by E. Hirschhorn (pp. 66–75).

Folha Veterinaria is being published at São Paulo, Brazil. The initial number consists largely of abstracts from other publications, but contains as its leading article A Case of Polyarthritis Due to *Escherichia communior*, by the editor, C. Neiva (pp. 1–3), and one entitled Observations on Mosquitoes Which Breed in the Internodes of Bamboo Canes, by A. Prado (pp. 13–15). These articles are in Portuguese but have English abstracts.

The East African Agricultural Journal is being published bimonthly at Nairobi with W. Nowell, director of the East African Agricultural Research Station, as editor and an editorial board composed of the directors of agriculture of Kenya, Tanganyika, Uganda, and Zanzibar. The initial number contains 17 brief articles on the agriculture of the region, together with reviews and meteorological notes.

State Aid to Agriculture is being published by the International Institute of Agriculture at Roma as "an international quarterly summary of government measures affecting the prices of cereals, meats, and dairy products." The initial number deals with Germany, France, Great Britain and Northern Ireland, Italy, and the Netherlands. Subsequent issues are to contain similar reports for other countries which are important as producers or consumers.

Conservation, "a digest for the conservationist", is being published bimonthly by The American Forestry Association at Washington, D. C. The initial number contains, among others, articles entitled Can Dust Storms Be Conquered? by H. H. Bennett, Chief of the U. S. D. A. Soil Conservation Service (p. 1), and Conservation Redefined, by R. G. Tugwell, Undersecretary of Agriculture (p. 4).

Garden, "a magazine of plants and flowers," is being published quarterly at 819 Magazine Street, New Orleans, La., with the endorsement of the New Orleans Horticultural Society, the New Orleans Garden Society, and the Louisiana Garden Club. Among the articles in the initial number is one entitled The Bulbs Called *Zephyranthes*, by H. H. Hume (pp. 15–20).

Rodriguésia is being published quarterly by the Institute of Plant Biology of the Botanical Garden of Rio de Janeiro. The initial number describes some of the activities of the garden, and includes several original articles, among them Notes on a Woody Gall of Guava, by F. Romano Milanez (pp. 3–7), and A Disease of Potato in Theresopolis, by N. da Silveira e Azevedo (pp. 9–12).

Rural Electrification News is being issued monthly in mimeographed form by the Rural Electrification Administration. Its purpose is announced as to "chronicle the progress of the rural electrification movement, including the development of the Rural Electrification Administration's projects, policies, and publications."

Journal of the British Honduras Agricultural Society is being published quarterly. Among the articles in the initial number is one by E. F. Strachan entitled Mycotic Stomatitis of Cattle (pp. 11, 12), and another by D. D. Haynes entitled Rice in the Caribbean Area (pp. 26, 27).

Revista de Parasitología, Clínica, y Laboratorio is being published bimonthly at Habana, Cuba. The initial number contains original articles, abstracts, and notes, largely from the standpoint of human pathology.

Arborist's News is being published monthly by the National Shade Tree Conference at New Brunswick, N. J. It will contain abstracts from the current literature pertaining to shade trees.

EXPERIMENT STATION RECORD

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RESEARCH AT THE 1935 CONVENTION OF THE ASSOCIATION OF LAND-GRANT COLLEGES AND UNIVERSITIES

For at least two reasons the forty-ninth convention of the Association of Land-Grant Colleges and Universities, held in Washington, D. C., November 18–20, 1935, and discussed in its general aspects in the January issue of the *Record*, was inevitably of much importance to research in agriculture and home economics. It was the first comprehensive gathering of experiment station directors since the passage of the Bankhead-Jones Act (E. S. R., 73, p. 289); and the developments of the past year in relation to an agricultural program along national and regional lines had greatly intensified interest in close coordination between Federal and State research agencies. Very appropriately the program of the convention gave prominence to topics of direct pertinence along both these lines, and the meeting was undoubtedly of great assistance in providing a clearer understanding and an impetus toward increased cooperation.

The public sessions of the subsection on experiment station work were opened with a paper by M. L. Wilson, Assistant Secretary of Agriculture, entitled The Regional Principle and Agricultural Research. Secretary Wilson drew attention to the increased interest in the regional method of approach to various current problems, which he visualized as " an expression of national growth, a new and growing frontier of adjustment between political units and economic and social needs." He pointed out that in agricultural research, with its dual system of Federal and State agencies, the question of relationships has been of perennial interest, and it was his personal view that on the whole the relationships between the two systems had been very good and that there had been little unwarranted duplication. Nevertheless he drew attention to the possibility of criticism on the ground that " there is a waste of funds in supporting researches which are paralleling and duplicating each other." " Within the not too distant future," he warned, " we may expect a national psychology to develop either for economy, for cutting everything to the bone, or for governmental reorganization, coordination, and simplification. . . . Research administrators looking to the future in both systems of research should pause to consider the attacks that may be made on agricultural research from either of the angles above."

Aside from this prudential aspect, Secretary Wilson ascribed the widespread interest in regional research to an increased consciousness of (1) "national maladjustments in our agricultural system", and (2) the need of and a trend toward "expensive projects of considerable duration, which cause research administrators to think more and more in terms of cooperative relationships." He therefore concluded that without sacrifice of identity or loss of responsibility by either Federal or State agencies to their respective seats of authority—Congress and the State legislatures—there is "a possibility of a kind of democratic procedure in this new zone of regional research in which both can pool their interests and which will represent a true expression of democracy in research." As steps in this direction, he suggested the strengthening of the Office of Experiment Stations, the provision of a national research planning council or board, the developing of what he called "research guilds" of the highly technical workers, and the recognition of the need of sustained agricultural planning of a broad comprehensive character by setting up "some kind of coordinated, permanent research which can be democratically administered by both the research systems."

Extended discussion led by Directors J. G. Lipman of New Jersey and C. T. Dowell of Louisiana followed the presentation of Secretary Wilson's address. Director Lipman's paper was in the main a detailed analysis of regional research in general as to its content, method, and opportunities. Director Dowell corroborated Secretary Wilson's views as to the new interest in this type of research, the importance of cooperative relationships in recent years, and the comparative lack of unwarranted duplication of work, but suggested the need of as much delimitation of function as possible between Federal and State agencies. Considerable diversity of opinion developed in the discussion as to the details of organizing and administering regional projects, but there appeared to be substantial agreement as to the fundamental principles involved and the need of concerted action.

The subject of regional adjustment in agriculture also formed the closing theme in the section on agriculture. In this connection the research project in regional adjustment carried out in 1935 by the experiment stations in all the 48 States in cooperation with the Agricultural Adjustment Administration was described by H. R. Tolley of the Giannini Foundation of Agricultural Economics, now a collaborator of the AAA. Much of the effectiveness of agricultural adjustment to date was ascribed by him to the fact that a vast body of information with a direct bearing on adjustment problems had been accumulated by the stations and the Department. "Future adjustment programs", he went on to say, "can be successful only if they are pointed in the right direction. One of the most vital elements affecting the direction they take will be research. For this reason it is highly important that research in the future should deal with adjustment problems more directly than in the past. If, as seems probable, adjustment efforts are going in the direction of flexibility and regionalization, there must be more emphasis on the regional approach. A greater degree of consideration between the work of economists on the one hand and that of physical and biological scientists on the other will be needed. Such coordination is one of the big accomplishments of the regional adjustment project to date."

Two other papers which dealt largely with the planning and coordination of research were given by Directors R. E. Buchanan of Iowa and L. E. Call of Kansas before the section on agriculture, while a third, by Extension Director R. K. Bliss of Iowa, entitled Cooperation between Resident Teaching, Research, and Extension, was read before the section on home economics. Directors Bliss and Buchanan discussed rather specifically what had been done in Iowa to set up and develop objectives in agriculture and to solve the problems involved by a well-coordinated attack along comprehensive lines. Director Call reviewed some of the achievements of the past and stated that the Bankhead-Jones Act "affords the best opportunity yet presented to the State stations and the U. S. Department of Agriculture to develop a well-coordinated research program from both a regional and a national viewpoint." Among the conditions which experience has shown to be highly essential for the planning of research projects on a coordinated basis, he discussed the need of establishing some directing agency for the organization and conduct of projects, the development of group consciousness on the part of individual workers, and the provision of frequent conferences of specialists.

Still another paper dealing with these problems was that given in the general sessions by Dr. William Charles White, chairman of the division of educational relations of the National Research Council. Discussing the subject of research in the land-grant colleges, Dr. White said that "at this stage of our evolution, when knowledge has grown so rapidly, we need to have experiments in methods of cooperative research where groups of specialists can carry out studies which have been carefully planned much as an architect plans a building." As examples of cooperative research in other lines, he called attention to recent studies of tuberculosis and drug addiction, which he declared have shown that "it is possible (1) to define a problem with a definite objective in view, (2) to persuade those to undertake their part who are best fitted to attack the various phases of that problem, (3) to correlate by frequent conferences the results obtained and to stimulate cooperative effort to further solution of the problem, (4) to have units working in geographically distant parts of the country and yet to integrate the work of each division toward a definite objective and to advance the knowledge in that field, (5) to utilize already existing physical and mental equipment wherever the best person is situated and to add to this equipment with benefit to the institution and the research worker with a minimum expenditure of funds, (6) to establish by virtue of work on a special problem specialized training in fields not oversupplied with trained workers, (7) to maintain a mutually beneficial cooperative spirit between voluntary agency, private industry, educational and research institution, and government." In conclusion he pleaded for the determination by individual institutions of their objectives in relation to their environment and national relationships and "the termination of relatively unimportant studies and the utilization of funds so saved for more important studies which become apparent as knowledge increases."

Much of the discussion as to administrative problems under the Bankhead-Jones Act was necessarily technical and of restricted popular interest, but the introductory paper by Dr. J. T. Jardine, Chief of the Office of Experiment Stations, dealt mainly with general principles. Dr. Jardine drew attention to the difficulty of formulating a program for Bankhead-Jones research at this time with the idea of either completeness or finality. "Any such program", he stated, "must keep in mind both the short-time view and the long-time view. The problems of national and regional scope, as well as those of importance primarily to one State or locally, should be kept in mind. The relationships of this fund to the much greater fund from other sources, including other Federal-grant funds, State appropriations, miscellaneous funds, and funds available to the Department of Agriculture, must be taken into account. The shortcomings of our present research and research relationships and the possibility of improving and strengthening the weaknesses and relationships through the use of this new fund should be given thought. The urgent request for research under the Bankhead-Jones funds, Federal as well as State, indicates a need and interest and, to a considerable extent, a demand for research greatly in excess of the funds available. This fact calls for some flexibility in any proposed program in order to best meet the situation in individual States, as well as regionally and nationally."

However, "over the next 5 yr.", Dr. Jardine went on to say, "a Bankhead-Jones program should be developed which is outstanding for coordinated effort on State, regional, and national problems. I am confident that this can be done without undue neglect of purely State problems, without sacrifice of State integrity or authority, and in the interest of public confidence and support of research. The basis of action should be not compulsion, regulation, or regimentation, but purposeful effort on the part of research workers and research administrators."

Real progress in this direction already, he declared, has been obtained. "Directors and research workers are taking the lead in proposing coordinated research attack on problems basic to agriculture in a number of States or a major region. When the Bankhead-Jones program is finally under way for this year there will be many additions to the present undertakings in which more than one State is involved, in spite of the fact that the fund this year is not large and was not promptly available." He concluded by announcing that "the Office of Experiment Stations will cooperate with individual stations in adjustments designed to be in harmony with the proposed course and at the same time meet the situation for the individual State, and will cooperate with groups of States in furthering collective action which they may propose."

Still another theme to which consideration was given in the station subsection was that of the publication of research. The report of the joint committee in charge of the *Journal of Agricultural Research* showed that about 150 manuscripts were accepted for this publication during the year, that these were about equally divided between the stations and the Department, and that the time elapsing between the date of submission of an article and its appearance in printed form had been reduced very materially. A special committee headed by Director S. W. Fletcher of Pennsylvania reported the results of a comprehensive survey of the general situation, advocating in preference to the subsidizing of private journals the development of the stations' own technical series but with a liberal policy in the purchase of reprints for such articles as are deemed most appropriate for technical journals.

Taken as a whole, the convention revealed unmistakably the steady progress which is being made toward the development not only of efficient research units but of a well-organized and effective national system. The will to cooperate, it has often been said, is a fundamental requisite in concerted action. This will was much in evidence at the convention, and with it a distinct consciousness of mutual interdependence and responsibility. This feeling is particularly opportune at the present time, and its growth should be productive of much tangible advancement.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical work of the Puerto Rico College Station], R. Arroyo (*Puerto Rico Col. Sta. Rpt. 1934, pp. 46, 47, 151–157*).—Data are reported on a method for the production of α-cellulose from cane bagasse and foliage in which the organic aliphatic acids (especially those inexpensively prepared from blackstrap molasses) may be substituted for nitric acid; on the biochemical production of butyric acid from sugar factory final molasses; on the utilization of sugar factory filter press mud for the preparation of activated char and for cane wax extraction; on the extraction and purification of essential oils from native fruits, flowers, and plants; on the fermentation of the vanilla bean; and on the canning of native fruits.

Chemistry of corn seed germination, R. C. Malhotra (*Cereal Chem., 11 (1934), No. 1, pp. 105–109, fig. 1*).—Starch, hemicelluloses, and calories of heat, as well as fats, decreased, while sugars increased during corn seed germination. Proteins remained constant. The seedling weighed less than the seed. The embryo contributed fats, and the endosperm supplied carbohydrates during germination. When the isolated corn embryo was allowed to germinate, fats, starch, hemicelluloses, sugar, and calories of heat decreased. Nitrogen and ash did not change.

Some effects of heat exposure on wheat starches, C. E. Mangels (*Cereal Chem., 11 (1934), No. 1, pp. 86–94, figs. 6*).—In the investigation here reported from the North Dakota Experiment Station, exposure to temperatures of 80°, 100°, and 120° C. for 8 hr. had very little effect on the specific rotation of wheat starch, but a tendency for specific rotation to decrease was observed.

Exposure at 100° for 8 hr. slightly decreased the resistance of starch to diastase. When exposed to dry heat for 8 hr. at 80°, 90°, and 100°, respectively, the starch from hard red spring wheat flour showed relatively little change in swelling capacity. The starches from winter wheats, when subjected to heat treatment, showed a much greater increase in swelling capacity than did those from hard spring wheat. Exposure at 80° or 90°, however, gave relatively small changes as compared to exposure at 100°. Durum starch showed about the same increase in viscosity when exposed to heat as did the winter wheat starches.

A classification of biscuit and cracker products from the machine viewpoint, O. Johnson (*Cereal Chem., 11 (1934), No. 1, pp. 113–116*).—The author of this note from the Washington Experiment Station gives a nontechnical description of the various commercial types of baked pieces, the machines used in forming them, and the physical dough or batter characterstics required by each of the seven machines discussed.

Destroying mold spores on bread by ultra-violet radiation, J. W. Read (*Cereal Chem., 11 (1934), No. 1, pp. 80–85*).—The carbon arc was found capable of emitting "a much higher intensity of the shorter fungicidal wave lengths" than the mercury vapor lamp, and carbons could be selected especially for their high-intensity radiation in the lethal wave length band. " C " carbons, containing core materials including iron, nickel, and aluminum, were the most effective of those tested, and the radiation from such carbons destroyed heavy spore infection on the surface of the loaves in 45 sec. at a distance of 8 in. with the lamp operating on direct current at 75 a and 60 v.

Thin sheets of the transparent cellulose derivatives commonly used for wrapping " did not show any practical effect on the fungicidal potency of the radiation. Under the same conditions the mold spores were destroyed by the radiation which passed through the transparent sheeting just as readily as if they were on the uncovered surface of the loaf."

Chemical investigations of the tobacco plant.—V, Chemical changes that occur during growth, H. B. VICKERY, G. W. PUCHER, C. S. LEAVENWORTH, and A. J. WAKEMAN (*Connecticut [New Haven] Sta. Bul. 374 (1935), pp. 553–619, figs. 53*).—In the present phase of this series of investigations (E. S. R., 69, p. 771), the rate of growth of the tobacco plant was investigated by means of detailed chemical analyses of the leaves, stems, and fruit of a series of collections taken at frequent intervals between the seedling stage and an advanced stage in the ripening of the seed pods. The variety studied was Connecticut shade-grown tobacco, and the plants were grown under normal agricultural conditions under a shade tent as part of a general crop. The collections of plants were divided into two roughly equal lots, and were then dissected into leaf, stem, and, later, inflorescence or pod portions. The leaves and stems of one lot were separately extracted with boiling water, whereas those of the other lot were at once dried in an oven. The pods were dried.

Analyses of the extracts, residues from extraction, and of the dried samples were carried out by methods, many of which were developed in the station laboratory especially for application to the tobacco plant. Ratios between certain of the constituents and distributions of some of them in the three main parts of the plant, as well as the grams per individual plant, were calculated.

Together with the results that show the broad aspects of the rate of growth are presented data that show the rates of accumulation in leaves, stem, and pods of the organic solids, the ash, the water-soluble organic solids and ash, the total organic acidity, the quantities of malic, citric, oxalic, and of unknown acids, the total and the fermentable carbohydrates, the crude fiber, the ether extractives, the nitrogen both soluble and insoluble, and of the nitrate, nicotine, ammonia, asparagine amide, glutamine amide, amino, and peptide nitrogen. Correlations of certain of the data with each other were determined, special attention having been given to the effect of the onset of the reproductive period.

" It is not feasible to draw many detailed conclusions from a single experiment that represents the effects of but one growing season. Attention may be directed, however, to a few of the results that appear to have general significance.

" The data on the organic acids are the first that have hitherto been obtained by accurate and trustworthy methods from which conclusions can be drawn regarding the behavior of these substances in a growing plant. A rapid accumulation of a high relative proportion of oxalic acid in the very young tobacco plants was observed . . . and, if oxalic acid may be regarded as an end product, suggests an extremely rapid rate of metabolism in these plants. The most significant result, however, is the observation that the three chief acids—malic, citric, and oxalic—maintained a nearly constant ratio to one another in the leaves from the fortieth day to the end of the period of observation (110 days), although the total quantity of organic acids present increased about 400 percent in the interval between 40 and 75 days and then sharply decreased. This implies that the quantitative relationships of the three acids to one another were not affected either by rapid deposition in the leaves or by withdrawal from them. Manifestly the metabolism of these three acids is closely related, and it is clear that oxalic acid shares proportionately with the others in the chemical changes. No definite evidence was secured, however, that connects the organic acid metabolism with either the carbohydrate or the protein metabolism of the plant. Malic acid was at all stages of growth the predominant acid of the leaves, oxalic being the next in order, with citric in smallest quantity. The amount of unknown acids was intermediate between the oxalic and citric acids. In the stems the unknown acids predominated, malic and oxalic acids being present in considerably smaller amounts; citric acid was invariably present, but in only small quantities. In the pods also, the unknown acids predominated, malic acid coming next in quantity; traces only of oxalic and citric acids were present.

"The investigation of the amide nitrogen showed that our knowledge of the substances in the tobacco plant which produce ammonia on mild hydrolysis with acids is far from complete. The results with the leaf tissue could, for the most part, be satisfactorily interpreted on the assumption that asparagine and glutamine are the only amides present. The stem tissue, on the other hand, may contain a considerable proportion of an unstable amidelike substance in addition to these. If this is so, the accurate determination of glutamine and asparagine by the methods employed is impossible."

The chemical data for the three main periods of growth (from 3 to 4 weeks of little increase in the weight of the seedling, the period of rapid growth from about the thirty-fifth to about the seventy-fifth day, and the period of reproduction) are closely analyzed.

Studies on the nicotine content of cigarette smoke, C. O. Jensen and D. E. Haley (*Jour. Agr. Res.* [*U. S.*], *51* (*1935*), *No. 3, pp. 267–276, fig. 1*).—At the Pennsylvania Experiment Station a study of methods of determining nicotine, applicable to cigarette-smoke solutions, showed that pyridine does not interfere in the precipitation of nicotine by silicotungstic acid in concentrations below 0.02 percent, and that the concentration of pyridine in cigarette-smoke solutions is not high enough to interfere with the precipitation of the nicotine content of such solutions by silicotungstic acid. An apparatus which will smoke cigarettes, cigars, or pipes with puffs of constant volume and unvarying length at constant intervals is described.

It was found that the nicotine content of cigarette smoke varies inversely as the moisture content of the cigarettes, that the amount of nicotine in the smoke is directly proportional to the strength of the puff, and that there is a marked condensation of nicotine in the short unburned portion of a cigarette. Under the conditions of these experiments cigarettes with a moisture content of 11.13 percent contained more nicotine in the side stream than in the main stream, whereas cigarettes with a moisture content of 0 percent contained less nicotine in the side stream than in the main stream.

The use of cellulose, casein, and other products in synthetic plastics and resins, D. C. Carpenter and J. J. Kucera (*New York State Sta. Tech. Bul. 230* (*1935*), *pp. 20*).—The main chemical reactions underlying the processes of increasing importance to the synthetic resin and plastics industry are given, insofar as they are known. The manufacture, various properties, and numerous applications of phenol aldehyde, cellulose, vinyl and styrene, glyptal, urea, and casein plastics are discussed. Trade names of the various plastics are appended.

Note on the preparation of crystalline d-mannose and of crystalline d-ribose, P. A. Levene (*Jour. Biol. Chem.*, *108* (*1935*), *No. 2, pp. 419, 420*).—Specific directions for securing pure crystalline preparations of the two sugars, the first from vegetable ivory meal and the second from pure ash-free guanosine, are given. Means for obtaining *d*-mannose in either the α or β form are described.

An effective method of extracting vitamin B, S. ITTER, E. R. ORENT, and E. V. MCCOLLUM (*Jour. Biol. Chem., 108 (1935), No. 2, pp. 571–577*).—A method for preparing a potent extract of the vitamin B complex, involving the use of gaseous hydrogen chloride in absolute methyl alcohol, has been developed. The extract when fed at a level equivalent to 3, 5, and 10 percent of yeast produced as effective growth as yeast over a period of 10 weeks. The residues after extraction appeared completely negative with respect to vitamins B_1, B_2, and any other growth-promoting factors. As compared with extraction with methyl alcohol acidified with 5 percent concentrated hydrochloric acid, the method described was shown to be much more efficient, as judged by the potency of the respective extracted yeasts. The extract obtained was unusually low in the alkaline elements, thus providing a good source of the water-soluble vitamin B for inorganic deficiency studies.

"The extraction was not due to the presence of water but appeared to be a breaking up of the alcohol-insoluble linkages, rendering the vitamin soluble in absolute methyl alcohol."

Preparation and properties of vitamin E concentrates, H. M. EVANS, E. A. MURPHY, R. C. ARCHIBALD, and R. E. CORNISH (*Jour. Biol. Chem., 108 (1935), No. 2, pp. 515–523*).—An investigation reported from the University of California shows that the wheat germ used as raw material should be fairly fresh, and that after extraction of the oil the saponification process should be carried out with methanol as solvent. For removing the nonsaponifiable matter from the soap, most fat solvents other than ethyl ether were found to be unsuitable unless considerable alcohol or similar liquid be also added. Advantages of the process recommended, as indicated both by chemical and by biological tests, are pointed out. Wheat-germ oil, if sealed up in a vacuum in glass, appeared to keep its vitamin E content unimpaired for several years at room temperature.

Purification of substances by electrodialysis, A. L. ELDER, R. P. EASTON, H. E. PLETCHER, and F. C. PETERSON (*Indus. and Engin. Chem., Analyt. Ed., 6 (1934), No. 1, pp. 65, 66*).—In this investigation 98.4 percent of the ash content of a sample of acid precipitated casein suspended in dilute acetic acid was removed during an electrodialysis of 56 hr. From a suspension containing no added acetic acid, 95.2 and 97.3 percent of the ash were removed in shorter treatments. Casein precipitated by rennin gave up 72.9 percent of its ash content.

Commercial grape juice, diluted 1 : 1, yielded from 18 to 20 percent of its content of the tartrate radical in a 3-hr. dialysis, the flavor and color of the juice not being removed.

A galactose preparation and two arabogalactan preparations were freed from 91.3, 90.3, and 95.6 percent, respectively, of their ash contents.

Quick ash methods, E. B. WORKING and E. J. ANDERSON (*Cereal Chem., 11 (1934), No. 1, pp. 94–98*).—In a method contributed from the Kansas Experiment Station, a sample of but 0.3 g is burned and a small platinum dish, of about the size of a No. 2 and No. 3 crucible cover, is used, so that cooling in the desiccator after ashing is rapid. By means of a micropipette 0.35 cc of a solution containing 10 g of crystalline magnesium nitrate in 500 cc of 70 percent alcohol is dropped into the center of the flour. As soon as the solution has completely penetrated, it is ignited with a match, during which process the dish is placed on a cold plate of porcelain, metal, or other material that will prevent it from becoming hot enough to cause spattering. As soon as the alcohol is burned off the dish is placed in a muffle at 550° C. Burning was found to be usually complete in from 5 to 10 min. "The dish is placed in a desiccator, and cooling is complete by the time the desiccator can be carried to the balance. The ash is transferred to the balance pan by merely tapping the dish and weighed directly. The blank of the magnesium nitrate solution is determined by determining ash on one or two samples by the ordinary method, or by burning a 0.3-g sample without using the solution."

New type of antimony electrode for pH measurements, T. R. Ball, W. B. Schmidt, and K. S. Bergstresser (*Indus. and Engin. Chem., Analyt. Ed., 6 (1934), No. 1, pp. 60, 61*).—The authors prepared antimony electrodes coated with antimony sulfide by five different methods.

"Electrodes prepared by suspension in hot 0.30 N nitric acid for 1 hr., followed by saturation with hydrogen sulfide, may be used to determine the pH of solutions in the range from 2 to 10. Electrodes so prepared agree among themselves within about 3 mv if the pH is 10 or less, but may differ by as much as 11.5 mv in more alkaline solutions. Starch, sugar, and nitrates have no deleterious effect in the range over which the electrode functions in their absence. The electrode, like the oxide electrode, is useless in the presence of hydroxy acids."

Use of aëration in Kjeldahl distillations, W. B. Meldrum, R. Melampy, and W. D. Myers (*Indus. and Engin. Chem., Analyt. Ed., 6 (1934), No. 1, pp. 63, 64, figs. 3*).—The authors investigated the conditions favorable for carrying out Kjeldahl distillation using aeration. "With fairly rapid aeration at the boiling point of the solution distillation is complete in less than 15 min. In addition to the saving of time involved, the use of aeration is recommended because of the entire absence of bumping and the obviation of the danger of acid solution backing up into the condenser. The apparent disadvantage of more complex apparatus is actually very slight, the only additional requisites to that needed for an ordinary distillation being the guard tube and inlet tube, neither of which requires more than rinsing between distillations."

Determination of amino nitrogen in plant extracts, N. W. Stuart (*Plant Physiol., 10 (1935), No. 1, pp. 135–148*).—The plant tissues used in this study at the University of Maryland included apple leaves; rhubarb petioles and leaves; clover roots and tops; young cabbage plants; tomato, soybean, and sunflower plants; begonia petioles and leaves; and potato tubers.

Treatment of extracts of these tissues with neutral lead acetate, decolorizing carbon, and solid calcium oxide resulted in a decrease of gas measured as amino nitrogen by the Van Slyke method. The findings supported the validity of the method of low-temperature distillation with solid calcium oxide under reduced pressure which gave a maximum decrease in all cases. Acid derivatives of the phenols, as the tannins, reacted with nitrous acid in the amino determination producing gases measured as nitrogen, but this error was eliminated by distillation with calcium oxide. Reductions in gas measured as amino nitrogen of from 6.1 to 84.9 percent were found in 12 tissues extracted with water and 80 percent alcohol after the calcium oxide distillation, and 5 fractions of normal and phosphorus-deficient tomato plants gave similar decreases of from 26.4 to 42.9 percent after 10 months' storage in alcohol. Alcoholic storage of tomato plant extracts resulted in marked increases in ammonia nitrogen and decreases in α-amino nitrogen. In the case of 9 plant tissues, 80 percent alcohol extracted an average of only 63.7 percent as much soluble nonprotein nitrogen and 66.9 percent as much α-amino nitrogen as did distilled water at 25° C.

Colorimetric determination of fluorine, O. M. Smith and H. A. Dutcher (*Indus. and Engin. Chem., Analyt. Ed., 6 (1934), No. 1, pp. 61, 62*).—The use of quinalizarin (1,2,5,8-tetrahydroxyanthraquinone), proposed in the method of Willard and Winter (E. S. R., 69, p. 489) in place of alizarin in the determination of fluorine by the fading of the zirconium hydroxide lake, was found advantageous in determinations of the fluorine content of natural waters at the Oklahoma Agricultural and Mechanical College. The authors give the following directions for their procedure in applying the method for water analysis:

"Precipitate the sulfates by the addition of 5 ml of 2 percent barium chloride solution to 100 ml of the sample. After settling several hours, draw off a 50-ml portion for the test. The barium sulfate may be filtered off if desired. Add 3 ml of 1 to 1 hydrochloric acid and 5 ml of the zirconium nitrate-quinalizarin reagent and mix thoroughly. After 20 min. compare with standards made at the same time and in the same manner. Comparisons are easily made in American Public Health Association tubes with standard fluoride solution containing from 0 to 2 p. p. m. in steps of 0.2 part."

Determination of iron: Adaptation of the mercaptoacetic acid colorimetric method to milk and blood, G. Leavell and N. R. Ellis (*Indus. and Engin. Chem., Analyt. Ed., 6 (1934), No. 1, pp. 46, 47*).—The authors of this contribution from the Bureau of Animal Industry, U. S. D. A., adapted the color reaction of ferric salts with thioglycolic acid for the determination of iron in various biological materials. Oxidation with sulfuric and perchloric acids was substituted for dry ashing to avoid contaminations and losses in ashing. Standard iron solutions were made by dissolving 1 g of pure iron wire in dilute sulfuric acid, oxidizing with concentrated nitric acid, boiling out the nitrogen oxides and excess nitric acid, diluting to 1 l, and making further dilutions (with the addition of sulfuric acid to prevent hydrolysis of the iron salt) as required. The determination was made by comparison with a series of standards prepared from the standard iron solution immediately before use. The procedure described is considered more accurate than the thiocyanate colorimetric method.

Determination of lead as dilead hydrogen arsenate, C. L. Dunn and H. V. Tartar (*Indus. and Engin. Chem., Analyt. Ed., 6 (1934), No. 1, p. 64*).—This investigation showed that lead can be precipitated quantitatively from a solution of lead nitrate as dilead hydrogen arsenate by the use of a disodium hydrogen arsenate-arsenic acid buffer solution. "The proper acidity . . . for precipitation is pH 4.6—that is, just alkaline to methyl orange. Any marked change in the acidity due to the liberation of nitric acid will materially change the composition of the precipitate obtained. The acidity can be kept sufficiently constant during the precipitation by the gradual addition of a dilute solution of sodium hydroxide, using methyl orange indicator. The arsenate solution should be subjected to mechanical stirring during the precipitation."

Qualitative method for selenium in organic compounds, M. J. Horn (*Indus. and Engin. Chem., Analyt. Ed., 6 (1934), No. 1, pp. 34, 35*).—The author of this contribution from the U. S. D. A. Bureau of Chemistry and Soils digests in a Kjeldahl flask until colorless 1 g of the dried sample with 40 cc of concentrated sulfuric acid and 0.2 g of mercuric oxide, after which "the digest is cooled and made up to definite volume, if desired, with concentrated sulfuric acid. To 5 cc of the cooled digest in a test tube are added 2 drops of a 3 percent aqueous solution of codeine sulfate, with cooling and shaking after each drop. If the digest contains selenium, a green color develops and then rapidly changes to blue. When the method is applied to soils, the cooled digest should be centrifugalized and the test made on the clear supernatant solution."

Tests for interference were made with the following elements: Chromium, nickel, titanium, beryllium, molybdenum, thallium, tellurium, vanadium, boron, antimony, bismuth, arsenic, iodine, manganese, iron, silicon, and tungsten. Only vanadium interfered with the test, giving a dark greenish blue solution on the addition of codeine sulfate. Arsenic on digestion with plants gave no color, but on digestion with soils it gave a blue color which rapidly disappeared, leaving the solution a light yellow.

New volumetric method for determination of sulfate, V. R. Damerell and H. H. Strater (*Indus. and Engin. Chem., Analyt. Ed., 6 (1934), No. 1, pp. 19–21, fig. 1*).—In titrating sulfate solutions with standard solutions of barium chloride, drops of a specially prepared mercuric nitrate solution of low acidity served as an outside indicator, the continued presence of the sulfate ion being shown by the formation of the yellow basic sulfates of mercury. By placing drops of a color standard made up from potassium sulfate and potassium dichromate also on the spot plate and noting the time taken by the test drops to develop a matching color, a warning of the approach of the end point was obtained several cubic centimeters short of the end point.

The effects of the order of addition of reagents upon the sensitivity, of concentration upon reaction time, of acidity, of impurities, and of solid barium sulfate upon the end point are shown in tabulated experimental results.

"The method is recommended for routine analysis rather than for single determinations. All the solutions involved are of stable inorganic compounds and can be made up in large quantities and kept for long periods of time. . . . The authors are able to finish an ordinary titration, working individually and not knowing the sulfate content, in about 10 min."

A new method of estimating exchangeable bases in soils, A. N. Puri (*Soil Sci., 40 (1935), No. 2, pp. 159–163*).—The author proposes to leach out the exchangeable bases with a 0.5 N solution of ammonium carbonate, first heating the solution to 60° C. to insure the absence of ammonium carbamate and thereby to avoid the formation of soluble calcium carbamate. The filtrate from the leaching is evaporated to dryness, driving off the ammonium carbonate, and the potassium and sodium carbonates are separated from magnesium carbonate and small quantities of calcium carbonate by extracting them with 50 percent alcohol. The calcium carbonate is separated from magnesium carbonate by extracting the latter with ammonium carbonate solution and evaporating the filtrate to dryness. The residues remaining after expelling ammonium carbonate are in each case dissolved in excess standard acid and titrated with standard alkali.

Methods both for calcareous and noncalcareous soils are described.

Estimation of replaceable Na and K, exchange capacity, and degree of alkalization in alkali soils by ammonium carbonate extraction, A. N. Puri (*Soil Sci., 40 (1935), No. 3, pp. 249–253*).—The use of ammonium carbonate for the estimation of replaceable Na, K, exchange capacity, and degree of alkalization is advocated. The proposed method, very similar in principle to that noted above, is shown to be simpler than the barium hydroxide method and to be applicable without subjecting the soil to a preliminary leaching to remove soluble salts. The usefulness of a determination of the degree of alkalization for characterizing alkali soils is pointed out, and an adaptation of the procedure to this purpose is described.

A new method for the determination of the acid-base balance in food materials, J. Davidson and J. A. LeClerc (*Jour. Biol. Chem., 108 (1935), No. 2, pp. 337–347*).—The authors of this contribution from the Bureau of Chemistry and Soils, U. S. D. A., base a new method for the determination of the acid-base balance of foods on the direct titration of the ash, with corrections for sulfur and chlorine lost during the combustion of the materials. Phenol red was used as indicator in the ash titration because its end point indication occurs at a pH value closer to that of the blood than the end point pH value of phenolphthalein or methyl red.

"It is proposed to use phenol red or any indicator that registers the exact neutral point (pH 7.0) in obtaining the acid-base balance values in the titration method instead of the commonly used methyl red or phenolphthalein. The values obtained with phenol red were lower than those obtained with methyl red but higher than those obtained with phenolphthalein." In addition to the ash titration only two chlorine determinations (volumetric) and two sulfur determinations are required.

Analyses of vegetables by this method (15 samples) gave results that compare satisfactorily with those obtained by the usual computation method.

"The results obtained by the new titration method are lower than those obtained by the usual computation method, except for cauliflower, in which case they are higher. These discrepancies are satisfactorily explained by the fact that the stoichiometrical relations between phosphorus and the other elements of the ash are not taken into consideration in the computation method. In computing the base balance values from the ash constituents, the phosphate ion was uniformly considered to be bivalent, whereas in the actual relationships of the ash constituents it functioned as a monovalent, bivalent, or trivalent ion."

A simplified method for the determination of carotene in flour extracts, W. F. GEDDES, D. S. BINNINGTON, and A. G. O. WHITESIDE (*Cereal Chem., 11 (1934), No. 1, pp. 1–24, figs. 3*).—In this investigation it was observed that the difference in hue of gasoline extracts of flour and aqueous solutions of potassium chromate employed in the Winton gasoline color value determination is almost entirely eliminated when mercury arc radiation is substituted for white light as an illuminant.

"While the change in illuminant reduced the gasoline color values by approximately 50 percent, with a consequent reduction in spread between samples, this was more than offset by the greater precision attainable in matching, the use of mercury arc radiation giving a greater differentiation between flours, lower variability between observers, and a significantly lower random error."

It is further reported that "a comparison of the gasoline color values obtained by mercury arc illumination with spectrophotometric determinations of carotene on the same flour extracts, in the instance of 358 flours of varying pigment concentration, gave a positive correlation of 0.985 and a straight-line regression. The arbitrary gasoline color value units may thus be expressed in terms of carotene by employing the regression equation. The carotene equivalents for the Winton gasoline color standards fall on irregular values, and directions are given for the preparation of potassium chromate standards corresponding to even units of carotene. These values are dependent upon the use of mercury arc illumination and colorless redistilled solvent for the preparation of the flour extracts."

Other methodological details were also subjected to critical experimental study.

Diastatic activity in doughs and suspensions, Q. LANDIS (*Cereal Chem., 11 (1934), No. 1, pp. 24–35, figs. 7*).—The author finds that chemical methods for analysis of fermenting doughs for total sugars are at present inadequate. Some fermentation methods which are believed to be suitable for the present requirements of baking chemistry are described. It is shown that the potential sugar concentration in buffered suspensions and yeast-free doughs at constant temperature may be expressed by the equation: $Sp=\frac{s}{\log 2}\log t+p$. The potential sugar level in certain fermenting doughs and suspensions was found to be higher than that in yeast-free doughs and to consist of a linear and a logarithmic phase.

For determining sugar according to the biological method by measuring the pressure developed in a closed system during fermentation, the author describes an apparatus consisting of a 10-lb. pressure gage set into the metal cover of a pint fruit jar.

Examination methods for recognition of small quantities of tallow and hydrogenated coconut and palm oil in lard [trans. title], S. Péter (*Kisérlet. Közlem., 38 (1935), No. 1-2, pp. 25–35, figs. 2; Fr. and Eng. abs., pp. 34, 35*).—In studies at the Royal Hungarian Control Station for Dairy Products, it was found that the glycerides of lard properly crystallized out of an ether solution had a lower specific gravity than the similarly produced crystals of palmetto bistearin of tallow or of the tristearin of hydrogenated oils. In a biphase liquid system produced with alcohol of a given concentration, a solid deposit appeared in the upper phase only if the lard contained no other fatty substance and was not rancid. If there was a mixture of fats the heavier crystals of the palmetto bistearin and tristearin formed a thick deposit in the lower phase. The palm oil group could be recognized by a method similar to Valenta's with the modification that a greater difference is created between lard and palm oil by the addition of xylol, and the examination can be made at a lower temperature than in the proximity of the boiling point of glacial acetic acid.

These methods have a theoretical basis in the phenomenon of solution of the liquid and solid glycerides. A hypothesis explains the reason for the separation of a homogeneous system into two liquid phases during refrigeration.

A micromethod for the estimation of the fat-soluble ester glycerol contained in lymph, S. Freeman and T. E. Friedemann (*Jour. Biol. Chem., 108 (1935), No. 2, pp. 471–478, fig. 1*).—The authors describe a method which permits the estimation of small amounts of fat-soluble ester glycerol (a recovery of 1.05 mg of glycerol added in the form of tristearin, as against a calculated glycerol content of 1.02 mg, having been secured in a trial determination), together with the application of the method to determinations of esterified glycerol in lymph.

Sauerkraut rapidly gaining in favor, C. S. Pederson (*Farm Res.* [*New York State Sta.*], *2 (1935), No. 1, pp. 1, 3, fig. 1*).—A brief popular note gives some indication of the antiquity of the sauerkraut process and summarizes certain of the modern improvements brought about by a scientific study of the fermentation. The function of the salt in controlling the nature of the fermentation, and the need for temperature regulation, for the washing off of undesirable bacteria from the outer leaves of the cabbage, and for the protection of the surface of the fermenting mass from free access of air and from the entrance of dust, are among the points emphasized.

Improvements in fruit juices, D. K. Tressler (*Farm Res.* [*New York State Sta.*], *2 (1935), No. 1, pp. 4, 7*).—The importance of preventing the oxidation of certain of the components of bottled fruit juices is emphasized, a complete filling and capping of the bottles at a temperature a little above that required for pasteurization being suggested as a practical means of avoiding an air-filled head space.

A tendency of clarified cider to become cloudy after about 3 mo. of storage is considered to be best eliminated by treating the cider with bentonite and filtering with a filter aid of the infusorial earth type.

AGRICULTURAL METEOROLOGY

Scope and purpose of agricultural meteorology from the standpoint of investigation [trans. title], W. Kreutz (*Landw. Jahrb., 81 (1935), No. 5, pp.*

743–827, figs. 21).—This article emphasizes the opportunity and need for a more intensive investigation in agricultural meteorology and deals more particularly with intensive observations with reference to physiography, the daily course of soil temperature and its importance in practice, temperature relations in sand, loam, and humus soils, penetration of frost in the soil, extremes in plant growth and near the soil surface, and protective measures, particularly the effect of paper coverings on sand, loam, humus, and sandy loam soils. The plans, installation, and progress of certain studies of this kind at the Agricultural Institute of the University of Giessen are explained.

Mount St. Katherine, an excellent solar-radiation station, C. G. Abbot (*Smithsn. Misc. Collect., 94 (1935), No. 12, pp. 11, pls. 3*).—This bulletin reports highly satisfactory solar radiation observations on Mount St. Katherine, about 10 miles from Mount Sinai in Egypt, at an altitude of 8,500 ft. The concordance of observations at this place with those at Montezuma in Chile strengthened the author's confidence in the conclusions based on the Montezuma observations that "solar fluctuations of less than 0.5 percent are associated with notable weather changes." He believes that with additional observations as well placed as those of St. Katherine it would be possible to "furnish almost every day in the year solar-constant values with accidental errors not exceeding 0.25 percent" and thus establish beyond question the dependence of weather on solar variations.

The relation between diffused and total radiation and the duration of sunshine [trans. title], W. Gorczyński (*Met. Ztschr.* [*Braunschweig*], *52* (*1935*), *No. 6, pp. 201–206, fig. 1*).—Data are presented which show a wide variation and disparity between total and diffused radiation, depending especially upon the height of the sun and degree of cloudiness, but that radiation is in no sense directly proportional to sunshine duration.

Origin, prediction, and means of protection against night frosts [trans. title], T. Kadner (*Ztschr. Angew. Met., Wetter, 52 (1935), No. 5, pp. 164–167*).—Observations on temperature, precipitation, and cloudiness in Hamburg and the surrounding region are reviewed with reference to the occurrence and prediction of night frosts and protection against them as they affect particularly horticultural crops. Local conditions favoring frosts were found to vary widely within short distances. Protective measures, including covers of various kinds and heating, are briefly discussed.

Can we reduce or prevent frost injury on moors [trans. title], Freckmann (*Mitt. Ver. Förd. Moorkult. Deut. Reiche, 52 (1934), No. 9–10, pp. 117–124*).—To reduce the frost hazard to agricultural crops in the moorland areas of Germany, it is considered necessary to supplement frost-resisting varieties by proper cultural procedure, use of necessary fertilizers, and the application of from 17.8 to 26.7 lb. of copper sulfate per acre every 2 or 3 yr. By virtue of stimulating chlorophyll production, applications of copper sulfate have given increased frost resistance to plants. Stimulation of chlorophyll production decreases the time of interruption of photosynthesis incident to frost. Increased yields resulting from the application of copper sulfate have been reported for such crops as red clover, horse beans, buckwheat, lupines, and summer rye.—(*Courtesy Biol. Abs.*)

Principles of snow surveying as applied to forecasting stream flow, J. E. Church (*Jour. Agr. Res.* [*U. S.*], *51 (1935), No. 2, pp. 97–130, figs. 10*).—It is stated that the Nevada or percentage method of snow surveying is for the purpose of forecasting stream flow. This system originated in the Sierra Nevada where the Mount Rose snow sampler and scales were developed by the Nevada Experiment Station for accurately determining water content of snow along a selected snow course. The normal for the season is obtained by dividing the seasonal snow cover by the mean snow cover, or average of all preceding seasons. The discharge of the streams leaving the watershed has been found to bear a direct relationship to the measured water content of the snow. Thus a 75 percent snow cover on April 1 assures an approximately 75 percent run-off during April through July. Lack of normal spring precipitation, evaporation, and absorption are minor factors which affect the accuracy of the forecasts, but accuracy within 10 percent is usually obtainable. Preferred methods of measuring and forecasting and their application to various watersheds comprise the subject matter of this article.

Estimation of future wheat production from rainfall, H. J. Henney (*U. S. Mo. Weather Rev., 63 (1935), No. 6, pp. 185–187, pl. 1*).—From a study of methods of estimating Kansas winter wheat production several months before harvest on the basis of previous rainfall, the author concludes that "a preliminary estimate can be made in most areas 1 or 2 mo. before seeding; and a much better estimate can be made by the time the crop goes into the dormant period, i. e., November or December. Estimates before seeding must for the most part be based on cumulative rainfall for a 12-mo. period prior to the previous harvest. In the eastern third of the State, the estimates are an indication of the direction of variation from the average yield, and are of a practical value when one considers the advantages in having some idea so far in advance of harvest. . . . Since a high percentage of the United States winter wheat crop is produced under conditions similar to those in the different sections of Kansas, there appears to be a possibility of using weather records to indicate desirable adjustments in wheat production."

Excessive rainfall in Texas, R. L. Lowry, Jr. (*Tex. State Reclam. Dept. Bul. 25 (1934), pp. XII+149, figs. 115*).—This is a revision of a previous bulletin,[1] bringing it up to date and including additional pertinent data, with an introduction by A. M. Vance.

Similarity of climatic influences on yield of oats and potatoes [trans. title], G. Kunze (*Ztschr. Angew. Met., Wetter, 52 (1935), No. 6, pp. 179–183, figs. 2*).—This article brings out a striking similarity of climatic influences on the yield of oats and potatoes in various parts of Germany, and suggests that such similarity may extend to other crops and regions.

Monthly Weather Review, [May–June 1935] (*U. S. Mo. Weather Rev., 63 (1935), Nos. 5, pp. 157–182, pls. 22, fig. 1; 6, pp. 183–212, pls. 8, figs. 6*).—In addition to the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and bibliographical and other information, these numbers contain the following contributions:

No. 5.—The Distribution of Thunderstorms in the United States, 1904–33, by W. H. Alexander (pp. 157, 158); The Pennsylvania Fireball of February 27, 1935, by C. P. Olivier (pp. 158, 159); Relation of Seasonal Temperatures in the Missouri and Upper Mississippi Valleys to Antecedent Pressure Departures in Other Regions, by T. A. Blair and A. G. Topil (pp. 159–161); Snow-Garlands, by W. J. Humphreys (p. 162); Analyses of Rains and Snows at Mount Vernon, Iowa, 1934–35, by W. A. Krehl and N. Knight (pp. 162, 163); and Duststorms, May 1935, by W. A. Mattice (p. 175).

No. 6.—Meteorological Conditions Preceding Thunderstorms on the National Forests.—2, The Blue Mountains of Washington and Oregon, by W. R. Stevens (pp. 183, 184); Estimation of Future Wheat Production from Rainfall, by H. J.

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[1] A study of rainfall in Texas, B. F. Williams and R. L. Lowry, Jr. Tex. State Reclam. Dept. Bul. 18 (1929), pp. X+170, pls. 70.

Henney (pp. 185–187) (see p. 160); Studies of Hawaiian Rainfall, by W. T. Nakamura (pp. 188, 189); Temperatures in the Lower 5 Kilometers of the Troposphere above Rio de Janeiro, by A. B. Serra and L. D. Barbosa (pp. 190, 191); and Cloud Photography at the Manila Observatory, by C. E. Deppermann (pp. 191, 192).

SOILS—FERTILIZERS

[Indiana soil experiment field studies, 1919–34], A. T. Wiancko et al. (*Indiana Sta., Expt. Farms Rpts., Herbert Davis Forestry Farm, 1923–34, pp. 1–3; Huntington Field, 1919–34, pp. 1–3; Jennings Co. Field, 1921–34, pp. 1–6, fig. 1; Pinney-Purdue Field, 1920–34, pp. 1–6, 7, 8; Purdue-Vincennes Farm, 1925–34, pp. 1–6; Sand Field, 1924–34, pp. 1–5*).—Each of these reports upon the progress of continued field experiments (E. S. R., 70, p. 303) and discusses briefly the question how to treat this kind of land and the results of a general fertility test.

[Fertility studies at the Soils and Crops Experiment Farm], A. T. Wiancko and R. R. Mulvey (*Indiana Sta., Soils and Crops Expt. Farm Rpt., 1915–34, pp. 7–9*).—Results are tabulated and discussed of a general fertility test and a comparison of various phosphates.

Soil survey of Crawford County, Wisconsin, M. J. Edwards et al. (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpt.], Ser. 1930, No. 34, pp. 39, pls. 2, figs. 2, map 1*).—Crawford County lies in southwestern Wisconsin. Its area of 376,320 acres consists mainly of a much dissected plain bordering the Wisconsin and Mississippi Rivers, and traversed by the Kickapoo River and by a ramification of smaller streams.

Of 18 soil types here classified as 11 series, 2 types cover 44.5 percent of the total area surveyed, these being the Dubuque and Clinton silt loams, 26.2 and 18.3 percent, respectively. The 28.3 percent of rough broken land is of value mainly for forestry.

The survey was carried on in cooperation with the Wisconsin University and the State Geological and Natural History Survey.

A comparison between the suction method and the centrifuge method for determining the moisture equivalent of soils, G. J. Bouyoucos (*Soil Sci., 40 (1935), No. 2, pp. 165–171, pl. 1*).—The author of this contribution from the Michigan Experiment Station reports that the suction method (E. S. R., 61, p. 315) has been compared with the standard centrifuge method for determining moisture equivalent, and that the results show the two methods to agree fairly closely in the cases of the majority of soils investigated. In general, the suction method tended to give somewhat higher values than the centrifuge method.

"It is concluded that since both methods are empirical and give only comparative results, and since the suction method is simple, convenient, rapid, and infinitely more available, it should be of value especially to those laboratories that do not have moisture-equivalent machines."

The clay content of the soil as related to climatic factors, particularly temperature, H. Jenny (*Soil Sci., 40 (1935), No. 2, pp. 111–128, figs. 8*).—In this contribution from the Missouri Experiment Station "an attempt is made to correlate the average clay content of soils with climatic factors, particularly temperature", that is, the purpose of the investigation was that of ascertaining the nature of the function f in the expression,

$$\text{clay} = f\,(\text{temperature})_{m,\,v,\,p,\,r,\,t,\ \ldots}$$

in which m, v, p, r, and t, representing, respectively, moisture, vegetation, parent material of the soil, topography, and time, are to be maintained constant by a suitable selection of data, and the temperature is to show as wide a variation as possible.

Soils selected from Maine and New Hampshire southward were classified on the basis of their parent materials into seven groups, for four of which the data are here tabulated.

It was observed that within each of seven different groups of parent materials the average clay content of the soil increases from north to south, and temperature is considered to be the major factor responsible for the high clay levels in the South.

For constant moisture values the clay-temperature function is shown to be of exponential nature and to resemble Van't Hoff's temperature rule. An idealized clay-climate surface (three-dimensional graph) shows the variation of "climatic clay" in soils derived from granites and gneisses as a function of moisture and temperature.

The laws of soil colloidal behavior.—XVII, Magnesium silicate—its base-exchange properties, J. S. Joffe, L. T. Kardos, and S. Mattson (*Soil Sci., 40 (1935), No. 3, pp. 255–268, fig. 1*).—In the present installment of this serial contribution from the New Jersey Experiment Stations (E. S. R., 73, p. 15), the theories concerning the "anomalous" behavior of Mg in electrodialysis and base-exchange phenomena are discussed. The procedure employed permitted a study of the isoelectric hydrolysis of Mg-silicate mixtures, together with base-exchange determinations.

Mixtures containing free silica, together with the Mg-silicate complex, yielded to a mathematical interpretation whereby the individual exchange capacities of the free silica and the Mg-silicate complexes could be determined. It is pointed out that the mechanism of isoelectric hydrolysis is capable of accounting for various Mg-silicate minerals found in natural deposits. Several formulas to illustrate the composition of the Mg-silicate complex at pH 8.4 and 7.0 are suggested.

Absorbed sodium in soils as affected by the soil-water ratio, F. M. Eaton and V. P. Sokoloff (*Soil Sci., 40 (1935), No. 3, pp. 237–247*).—In an investigation carried out by the Bureau of Plant Industry, U. S. D. A., the proportion and absolute quantity of sodium (and usually of magnesium and of potassium also) shown by aqueous extracts of soils were found to be higher than those shown by displaced soil solutions. The proportion, and sometimes the absolute quantity as well, of calcium was lower in extracts than in displaced solutions.

"This release of Na with dilution cannot be ascribed to hydrolysis, and hydrolysis would fail to account for the decrease in Ca. The most satisfactory explanation of this phenomenon is that a cation-exchange reaction takes place when the water-soil ratio is increased. In this exchange, calcium enters the absorbing complex, and sodium (sometimes magnesium and potassium) is liberated. New Ca coming into solution from $CaCO_3$ and $CaSO_4$ with dilution tends to obscure the Ca absorption effect in many soils. The assumption that Na of aqueous extracts represents Na in the aqueous phase at field moisture appears to be untenable, and accordingly the practice of determining absorbed Na by deducting aqueous-extract Na from ammonium-extract Na may lead to erroneous results. Exchangeable sodium as estimated on the basis of 1:5 extracts may be less than that estimated on displaced solutions to the extent of 50 percent or more."

The percentage of sodium, as well as that of total bases, in displaced solutions was greater than the percentage of sodium absorbed (corrected on the basis of displaced solutions) by from 2.4 to 5 times. The percentage of sodium in 1:5 extracts exceeded the percentage of sodium absorbed (corrected on the basis of 1:5 extracts) by from 3 to 46 times.

Bicarbonate as indicated by 1:5 extracts of the 9 soils was from 4 to 17 times greater than that shown by displaced solutions. Sulfate tended to increase with dilution. This increase is ascribed in part to calcium sulfate coming into solution and in part to sulfate adsorption under field-moisture conditions. Certain soils gave absolute quantities of chloride by displacement higher than those indicated by 1:5 extracts. This is attributed to bound water in the soil, i. e., to water not functioning as a chloride solvent and not released during displacement.

Some chemical and biological changes produced in a Fox sandy loam by certain soil management practices, L. S. Carter (*Soil Sci., 40 (1935), No. 3, pp. 223–236, figs. 2*).—This investigation by the Michigan Experiment Station was carried out in soil of plats receiving various treatments.

Lime plus complete fertilizer and lime plus phosphate and potassium compounds were the most effective in increasing the volatile matter content of the soil. They also increased the nitrogen content, whereas all the other treatments decreased nitrogen content. Lime alone and lime plus individual nutrients slightly increased the loss on ignition. All the soil treatments increased pH values, available phosphorus, and crop yields, the lime plus complete fertilizer and lime plus phosphate and potassium salt treatments being the most effective. All the soil treatments increased the number of fungi in the soil and greatly increased the number of bacteria. All fertilizer treatments in addition to lime proved beneficial to bacterial growth.

The nitrifying power of the soil varied greatly with the source of nitrifiable nitrogen. An average of results for alfalfa meal, cottonseed meal, diammonium phosphate, and urea showed that the two plats giving the highest crop yields and containing the largest content of volatile matter and a high content of available phosphorus to have the greatest nitrifying power.

All the soil treatments except lime plus rock phosphate and gypsum increased the production of CO_2 from cellulose. The addition of $CaCl_2$ or KCl to soils receiving no field treatment decreased CO_2 production from cellulose, whereas Na_2HPO_4 and $NaNO_3$ increased it. CO_2 production in field-treated soils, compared with that from untreated soil, was increased by the addition of KCl, $CaCl_2$, or $NaNO_3$ but decreased by the addition of Na_2HPO_4.

Yields of sweetclover, rye, and soybeans grown in jars of the different soils in the greenhouse correlated with the yields obtained under field conditions. When the crop material grown on each jar was ground and an aliquot was returned to a portion of the soil from the jar, CO_2 production correlated in general with crop yield.

Investigations on the rôle of organic matter in plant nutrition.—IX, Oxidation of organic matter in the soil and plant assimilation, G. S. Siddappa and V. Subrahmanyan (*Indian Acad. Sci. Proc., 1 (1935), No. 12, Sect. B, pp. 928–937*).—Determinations in a number of soils from India, Burma, and Ceylon indicated that most of them—including some reputed to be fertile—were poor in organic nitrogen as compared with soils of temperate regions. Experiments showed that when a manure was added to a tropical soil sown to barley the larger yields were due more to its decomposition than to an increased availability of organic matter previously in the soil. The carbon content does not measure the availability, and the addition of minerals may influence the effects of organic manures. Treatment with minute amounts of chemical oxidizers helped to increase the availability of the organic matter in the soil, the effect on barley being most evident when sown shortly after treatment. Plants receiving an adequate supply of stable manure grew, at least in the early stages, independently of atmospheric carbon dioxide. The significance of these results is discussed.

Investigations on the rôle of organic matter in plant nutrition.—X, Influence of different forms of manganese on the oxidation of organic matter and release of plant nutrients, C. R. Harihara Iyer, R. Rajagopalan, and V. Subrahmanyan (*Indian Acad. Sci. Proc., 2 (1935), No. 1, Sect. B, pp. 108–135, figs. 22*).—Continuing this series of studies (see p. 163), plat experiments with ragi (*Eleucine coracana*) indicated that on both manured and unmanured soils small amounts of potassium permanganate led to increased yields of grain and straw, but that it was more effective when applied with the organic manure than later as a top-dressing. The permanganate applied passed rapidly into the water-insoluble state, as did also the other manganese compounds used.

Applications of the permanganate or of manganous sulfate caused an immediate but temporary reduction in the numbers of soil bacteria. With equivalent amounts of the different forms of manganese the decomposition of soil organic matter proceeded most rapidly in the presence of manganese dioxide, followed in the descending order of effectiveness by permanganate and by manganous carbonate and sulfate. Production of carbon dioxide followed the same order as the decomposition of organic matter in the soil, and there was a close correlation between loss of carbon and production of carbon dioxide. Less than a fourth of the oxidation of organic matter was due to the action of mineral constituents of the soil. About a third was due to the oxidizer when manganese dioxide was applied, and the rest to microbial action.

Tests with eight varieties of tomatoes demonstrated the advantages of supplementing organic manures with chemical oxidizers, from 30 to 100 percent higher yields being obtained. Manganese dioxide and potassium permanganate gave the best results, and of the varieties tried Ponderosa, King Humbert, and Golden Jubilee gave the best responses. In general, liming depressed the yields, but this adverse effect was greatly reduced by applying either manganese dioxide or the permanganate. Treatments with manganese compounds induced no appreciable differences in the fruits.

The general significance of the findings and certain useful lines for further research are suggested.

The effect of nitrogen content of rye on its rate of decomposition, W. B. Andrews (*Soil Sci., 40 (1935), No. 3, pp. 219–221*).—During the first month of the test, the coefficient of the correlation between the nitrogen content of the rye and its rate of decomposition in the soil was positive and high, but it became negative and fairly high after 1 mo., which would indicate a decomposition rate inversely proportional to the nitrogen content. The author of this brief note from the Mississippi Experiment Station comments that "soil micro-organisms draw upon the soil for nitrogen to build their bodies when the organic material being decomposed is low in nitrogen. The rye with a higher nitrogen content will require less soil nitrogen in the early stages of decomposition because that liberated by the decomposed rye will be used, and more nitrogen will be liberated by the rye of high nitrogen content. In the later stages of the experiment the rye of low nitrogen content was decomposing at a more rapid rate, which indicates that larger quantities of nitrogen would be tied up in the micro-organisms."

Soil bacteria that conserve nitrogen, III, H. J. Conn (*Farm Res. [New York State Sta.], 2 (1935), No. 1, pp. 8, 9*).—The author here concludes a series (E. S. R., 73, p. 159) of popular articles on the native soil bacteria. Brief mention is made of some further facts concerning the behavior of *Bacterium globiforme*, and the probable function of the types of bacteria under discussion in storing up nitrogen which would otherwise be subject to leaching in the spring and fall when plant growth is not rapid enough to take up the soil nitrates as they are formed and in releasing considerable quantities of carbon dioxide which can be utilized by plants.

A comparative study of the bacterial flora of wind-blown soil.—VI, Death Valley, California, with summary of six soil studies, L. M. Snow (*Soil Sci., 40 (1935), No. 2, pp. 181–190*).—The bacterial flora of a drifting sand collected in Death Valley, Calif., was examined and is discussed in comparison with that of wind-blown soils from Sandwich, Mass. (E. S. R., 58, p. 18), Tucson, Ariz., and other parts of the eastern and western United States (E. S. R., 73, p. 158).

It is noted that Death Valley "has the driest, hottest climate of the series," the material collected being a very dry, fine-grained soil showing a pH value of 9 and a high content of soluble salts.

"The plate count was low, 10 percent of which were actinomycetes. A few fungi appeared. A great abundance of colored forms appeared, with fluorescent colonies the most abundant, followed by yellow. One-third of the cultures selected for study were spore formers, and approximately one-half were Gram-positive. No yeasts, but a small percentage of pleomorphic forms, were found. Great fermentative activity was evident, with average amount of protein digestion and nitrate reduction. No *Azotobacter* was found."

Soil and fertilizer studies by means of the Neubauer method, S. F. Thornton (*Indiana Sta. Bul. 399 (1935), pp. 38, figs. 3*).—Using the Neubauer method for the greater part of the work, the author shows that no consistent or significant residual accumulation of available phosphorus or potassium resulted from various treatments of six continuous fertilizer experimental fields.

Very acid soils showed a tendency to be slightly more deficient in available phosphorus and potassium than those having a more nearly neutral reaction. "However, soils in any reaction range may be either very deficient in or abundantly supplied with either of these nutrients." No evidence that soil reaction may be used as an indication of fertilizer needs was found.

Comparative data for 460 surface soils and subsoils showed that subsoils are much lower in available phosphorus than surface soils. "With soils from the Middle West, subsoils are phosphorus deficient in almost all cases." Values for available potassium were only slightly lower in the case of subsoils than in that of corresponding surface soils.

The efficiency of added phosphorus and potassium fertilizers, as indicated by percentage recoveries, varied widely with different soils. For 20 soils, varying in pH from 4.5 to 8.0, phosphorus recovery varied from 4.4 to 56.8 percent with monocalcium phosphate and from 4.4 to 42.4 percent with tricalcium phosphate. The efficiency of soluble monocalcium phosphate was found to be determined very largely by the fixation capacity of the soil, the efficiency of insoluble tricalcium phosphate being influenced both by fixation capacity and solvent power. Potassium recoveries were relatively much higher than those of phosphorus, varying from 29.2 to 100 percent. "With a very acid Newton fine sandy loam soil, liming more than doubles the phosphorus recovery from monocalcium phosphate, but in this particular instance has very little effect on potassium recovery."

With separates from 8 types of domestic rock phosphates, neither the Neubauer method nor pot tests showed any significant influence of particle size on phosphorus availability. In both cases, differences between the various types of rock phosphates were greater than differences due to particle size. The separates ranged in particle size from greater than 50μ in diameter to less than 1μ in diameter and from 100 to 400 mesh.

"Phosphorus recovery from 22 different phosphorus carriers is increased by addition of potassium chloride, the average increase being 4 percent from both quartz sand and acid silt loam soil. Likewise, for 21 different soils varying in pH from 4.5 to 8.0, the addition of potassium chloride results in a consistent increase in the indicated available phosphorus supply. However, for the same soils the addition of neither monocalcium phosphate nor tricalcium phosphate produces a significant increase in the indicated available potassium supply. On the same 21 soils, an increase in recovery of phosphorus, added as either monocalcium or tricalcium phosphate, is obtained when potassium chloride is added. Ammonium nitrate gives a still further increase in recovery from tricalcium phosphate. Addition of monocalcium phosphate produces a slight decrease in the recovery of potassium added as potassium chloride, and tricalcium phosphate and ammonium nitrate produce only slight increases."

A bibliography of 77 titles is included.

Manure increases farm income, A. T. Wiancko, G. P. Walker, and R. R. Mulvey (*Indiana Sta. Bul. 398 (1935), pp. 20, figs. 6*).—The authors summarize and discuss findings from the soil fertility studies of the station indicating that on most farms, about one-third of the value of barnyard manure is lost by improper methods of conservation and handling. Light applications of manure made every 3 or 4 yr. were found more profitable than heavy applications on fewer acres at longer intervals.

"On light sandy soils, manure applied on wheat in winter gives much better returns than when applied for corn. On light-colored heavy soils, giving wheat a light winter dressing and applying the balance for corn is the most effective distribution. On variable soils, the most efficient use of manure is to first cover the light-colored areas, which are most in need of organic matter and nitrogen.

"On most farms it will pay to supplement the manure with some sort of commercial fertilizer, especially phosphate."

Sources of nitrogen: Anhydrous ammonia vs. ammonium sulphate vs. ammonium nitrate, R. J. Borden (*Hawaii. Planters' Rec.* [*Hawaii. Sugar Planters' Sta.*], *39 (1935), No. 3, pp. 198, 199*).—To obtain information with respect to the possibilities of anhydrous ammonia dissolved in and applied with the irrigation water, the author grew Sudan grass in Mitscherlich pots to which he supplied equal quantities of nitrogen in the forms of ammonium hydroxide solution, ammonium nitrate, and ammonium sulfate.

On an acid soil (pH 5.6) the nitrate was definitely superior to the sulfate, but there was little difference in effectiveness between the nitrate and the hydroxide solution. The three forms gave about equal results on a soil of pH 6.5. On a soil of pH 7.1 the ammonium sulfate was somewhat more effective than the nitrate or the hydroxide, with no appreciable difference between the results given by the latter two forms. For a slightly alkaline soil (pH 7.5) ammonium sulfate was definitely the best of the three forms, and ammonium nitrate was slightly better than the hydroxide solution.

Some plant food values in molasses and filter cake, R. J. Borden (*Hawaii. Planters' Rec.* [*Hawaii. Sugar Planters' Sta.*], *39 (1935), No. 3, pp. 180–190*).—In the preliminary experiments here reported the molasses and filter cake rendered nonavailable a considerable quantity of natural and applied nitrates. "We are not as yet certain that the nitrogen withdrawn from the available supply for the decomposition of these materials (either natural or added) will be returned. We are rather inclined to believe that most of it will never be available for further crop growth on these soils, and, since we are sure that it was not leached out, we are inclined to ask if it has been lost as elemental nitrogen during the decomposition processes that have taken place."

Of the plant food elements added to the soil by the organic matter under discussion, it was observed that "both the potash content of molasses and the phosphate content of filter cake appear to be equivalent to the corresponding nutrients in commercial fertilizers. In fact the phosphate of filter cake appears to be considerably more effective than a water-soluble phosphate fertilizer, when used on an acid soil. However, if these materials are to be used for their potash or phosphate content, with the idea of saving money on purchased mineral fertilizer materials, it must be recognized that some of the purchased nitrogen fertilizers will be used by them and that such nitrogen may probably be permanently lost to the crop. Hence, what at first might appear to be a direct saving in potash or phosphate fertilizer costs may not actually prove to be as great, when a proper assessment is made against these byproducts for the available nitrogen that is withdrawn by the soil microbiological activity that is stimulated when the molasses or filter cake is applied."

Phosphate fixation in soils, particularly as influenced by organic matter, J. L. Doughty (*Soil Sci., 40 (1935), No. 3, pp. 191–202*).—An investigation of the Wisconsin Experiment Station had the object of ascertaining the effect of the following treatments on the power of the organic matter of soils to fix added phosphate: (1) Leaching with hydrochloric acid, (2) leaching with sodium hydroxide and ammonium hydroxide, (3) oxidation of the organic matter with hydrogen peroxide, and (4) heating at temperatures up to 800° C. The fixation of phosphate by natural and synthetic humus material and the effect of heat on the solubility of two phosphatic compounds were also studied.

Leaching the soils with hydrochloric acid reduced the power of fixing added phosphates. The ferric iron in the acid leachings possessed a fixing power somewhat greater than that of the soils from which these leachings were obtained. Leaching peat with sodium hydroxide or ammonium hydroxide increased its fixing power because of an increase in the active iron content. The alkaline extracts did not fix phosphates. Natural and synthetic humus did not fix phosphate. Oxidation of the organic material with hydrogen peroxide decreased the power of soils to fix added phosphates, the decrease being greater when the oxidation was more nearly complete. This loss of fixing power is attributed to a saturation of the fixing material with phosphorus liberated from organic compounds during oxidation.

Heating peat at 600° for 2 hr. did not destroy its power to fix phosphate, but heating at 800° for 2 hr. caused a complete loss of fixing power. The increase in phosphorus soluble in 0.002 N sulfuric acid when peat was heated at 800° is attributed to a reaction of ferric phosphates with lime to form calcium phosphate. Heating a mixture of ferric phosphate and calcium oxide to 800° caused a large increase in phosphorus soluble in 0.002 N sulfuric acid. When aluminum phosphate was heated under the same conditions there was less soluble phosphorus than in the unheated material.

"The evidence shows that soil organic matter as such has only a minor role, if any, in the fixation of phosphorus in difficultly available form when soluble phosphatic fertilizers are applied to a soil."

Sorption of phosphates by non-calcareous Hawaiian soils, L. E. Davis (*Soil Sci., 40 (1935), No. 2, pp. 129–158, figs. 6*).—In a study of the phosphate fixation, recently investigated in other Hawaiian soils (E. S. R., 71, p. 754), as it occurs in two upland Hawaiian soils, it was found that "the characteristic 'adsorption' curves obtained are ambiguous; they might imply any type of reaction." For any given equilibrium concentration of phosphates, the amounts fixed were found proportional to the ratio of soil to solution employed in the experiments. "This is held to be a decisive objection to the possibility that the process is due to double decomposition." Fixation was reversed very slowly, the slow rate of both the direct and indirect processes casting doubt upon adsorption as an explanation. Marked fixation occurred in soil in which the replaceable bases had been exchanged for alkali metal ions. Cations were absorbed along with the phosphate. At various pH values a ratio of 3 equivalents of cations to 1 mol of phosphorus held approximately. The degree of fixation was found to be a function of the H-ion concentration of the solution. Fixation occurred to a large extent in solutions maintained at a pH of 0.70 to as low as 0.25.

It is tentatively concluded that phosphate fixation in soils artificially depleted of replaceable bases which can precipitate phosphate is due to absorption of the phosphate by the soil minerals and the formation of equilibrium complexes, and that in many soils not so depleted this process nevertheless predominates. A theoretical explanation for the fact that the quantity of phosphate fixed is dependent upon the pH of the solution is developed in accordance with the Donnan equilibria.

Fluorine, its effect on plant growth and its relation to the availability to plants of phosphorus in phosphate rocks, R. P. Bartholomew (*Soil Sci., 40 (1935), No. 3, pp. 203–217*).—To learn the effect of soluble fluorine compounds on seed germination, plant growth, and phosphate availability, solution cultures, pot tests, etc., were made at the Arkansas Experiment Station with Sudan grass, cowpeas, soybeans, red clover, and white Dutch clover as test plants.

Concentrations of fluorine as large as 50 p. p. m. did not seem to decrease significantly the germination of any of these species. The germination of white Dutch clover was markedly increased by the presence of calcium fluoride and sodium fluosilicate. Soluble fluorides up to 10 p. p. m. fluorine did not materially decrease the amounts of dry matter produced by cowpeas grown in culture solution. The addition of soluble fluorine compounds to the soil did not seem to affect the availability of the phosphorus in the soil or that added as monocalcium phosphate. The presence of fluorine in naturally occurring phosphate rocks greatly influenced the availability of their phosphorus to plants. Specific correlations were found between both the total amounts of dry matter produced by Sudan grass grown in an acid silt loam soil and the milligrams of phosphorus found in the plants with the milligrams of fluorine added to the soil in the phosphate rocks.

Fluorine in the plants was found largely in the roots, and was present in the tops only when the amounts in the roots were relatively large. A general tendency of the phosphorus percentage in the tops to decrease as the percentage of fluorine in the roots increased was noted.

Evidence given is considered to substantiate the theory that "the availability of the phosphorus in rock phosphate is largely a matter of the rate of solution of the rock phosphate."

An apparatus for determining purity of marls, L. M. Turk (*Michigan Sta. Quart. Bul., 18 (1935), No. 1, pp. 29–32, fig. 1*).—Since the soil acidity neutralizing power of marl is due principally to calcium carbonate, "a known weight of marl is treated with acid, and the volume of carbon dioxide given off is determined, from which value can be calculated the purity of the sample. The principle of the method here described is not new in any sense of the word, but the general arrangement of the apparatus and method of procedure in making it applicable for routine work is different from any that has been called to the attention of the writer." With samples weighed out on a balance sensitive to 0.1 g, the method was found to be accurate to about 3 percent. A drawing and schedule of operations show the manner in which the apparatus is set up and used.

AGRICULTURAL BOTANY

Chronica Botanica, edited by F. Verdoorn et al. (*Chron. Bot., 1 (1935), pp. 447, figs. 151*).—This new annual, devoted to all branches of plant science, technical and applied, gives world reviews of the important current researches in this field; illustrated professional and personal news; notes on future events; indexes of the main acquisitions of herbaria, botanical gardens, etc.; reports and notes on societies, congresses, etc.; an up-to-date address book of institutes and societies, including individuals connected with them; general articles; an almanac of events, past and future; a section of correspondence; lists of new publications; and other data of interest.

While most of the material included is obtained from answers to questionnaires sent to all institutions and societies, a staff of collaborators is also maintained for collection of further data.

Indexes of names of plants and of their parasites and of persons are provided.

Comparison of the heating and freezing methods of killing plant material for cryoscopic determinations, T. D. Mallery (*Plant Physiol., 9 (1934), No. 2, pp. 369–375*).—A comparison of the results obtained in killing cotton and creosote (*Larrea*) tissues for cryoscopic determinations showed that for an extensive series of determinations over a period of time the heating method gave as reliable indications of the changes in sap concentration as did the more expensive and time-consuming method of freezing.

Application of calorimetric methods to ecological research, F. L. Long (*Plant Physiol., 9 (1934), No. 2, pp. 323–337, figs. 2*).—The method of determining the heat of combustion by an oxygen bomb calorimeter was adapted to plant studies of energy relations, being so constructed as to avoid heat leakage by surrounding the apparatus proper with jacketing walls through which water at a temperature corresponding to that of the calorimeter was run.

Tests of various kinds with many species of plants led to the conclusion that the calorimetric method brings into ecology, agriculture, forestry, horticulture, etc., an accurate chemical procedure for measuring performance. It thus becomes possible to obtain exact data not only on how much energy is utilized, but also on how much is stored in the various plant organs. The efficiency of individual plants, varieties, or species may by this method be compared with that of others grown under the same conditions, thus serving as a basis for selection or breeding. The plant itself may serve as an index of the energy available at different altitudes or latitudes, under various natural or artificial canopies, or in connection with long- and short-day exposures. The method also makes possible the obtaining of the reactions of the plant to varying amounts of water, of fertilizers and other soil nutrients, of air in water-logged soils, etc. The effect of the time and intensity of the grazing of range grasses or of the time of cutting of alfalfa can be accurately measured, and on the basis of the amounts of stored foods perhaps forecasts can be made of the next season's growth. Furthermore, the competition in the community and the adaptation in the individual plant can be evaluated more accurately and objectively by the calorimeter.

Wild flowers in Kansas, F. C. Gates (*Kans. State Bd. Agr., [Quart.] Rpt., 51 (1932), No. 204–B, pp. 295, figs. 448*).—This contribution from the Kansas

State College constitutes a manual of 450 species of wild flowers selected on the basis of abundance and distribution in the State. Keys for the identification of genera and species are provided. A foreword is by L. E. Melchers, and the drawings are by Mrs. Albert Dickens.

Translocation and growth balance in woody plants, W. E. Loomis (*Ann. Bot. [London], 49 (1935), No. 194, pp. 247-272, figs. 12*).—The following lots of trees were used in this study: 120 5-year-old Wealthy apple trees (1929), 165 2-year-old poplar whips (*Populus nigra*) (1930), 17 boxelder seedlings (*Acer negundo*) averaging 12 yr. old, and 50 framework branches on 10 15-year-old apple trees (1932). Ringing and other treatments were replicated at least 5, and usually 10, times, and samples for chemical analysis comprised material from 5 to 10 trees. The results were as follows:

Phloem rings on woody plants temporarily checked the movement of both carbohydrate and organic nitrogen compounds, and it is suggested that the cells of the ringed segments became increasingly permeable so that organic materials were lost into the xylem and thus finally moved past the interruption in the phloem. In all the plants studied only organic nitrogen was found in the tops, and the movement of nitrogen was checked by ringing. In a single test the movement of the ash was apparently not affected by ringing. The data at hand appear to indicate that the organic or inorganic form determines whether or not nitrogen, and presumably other elements, moves normally in the phloem or in both phloem and xylem. Whether nitrogen moves upward in the xylem or phloem probably depends first on the form of nitrogen and second on the condition of the living cells bordering the xylem. It is believed that nitrogen synthesized to organic forms in the roots normally moves upward in the phloem, but that escape into the transpiration stream is not impossible.

Secondary growth in the limbs and trunks depended on the active leaf area with uninterrupted phloem connection to the growing segment. Photosynthetic activity in the leaves undoubtedly precedes normal cambial growth.

Primary growth was preceded by an accumulation of the simpler forms of organic nitrogen, and apparently depended on them. It is suggested that simple organic nitrogen compounds can be condensed to protoplasmic proteins in the massed and compact apical or callus meristems or in the leaves, but not in the thin layer of the cambium.

The following outline of nitrogen movement in woody plants is proposed: (1) Inorganic nitrogen is absorbed and synthesized into soluble organic forms by the roots when they are adequately supplied with carbohydrates, (2) permeability relationships normally confine the upward movement of these materials to the phloem, (3) soluble organic nitrogen compounds may be used directly by the apical meristems of the top and presumably also of the roots, or (4) they may be moved to the leaves, condensed into more complex forms, and returned by way of the phloem to be used either in secondary growth or in storage, and (5) stored proteins are made available by digestion to soluble forms which then behave like soluble forms from the roots.

The growth materials moving from the leaves showed a definite tendency to move and to act downward and the materials accompanying primary growth upward. Apparently there was some probability of these movements being connected with polarity.

The absence of any effect from developing apical meristems freed of leaves and the quantitative nature of the relation of the leaves to secondary growth apparently exclude the action of "hormones."

Lateral water transfer in leaves of Ginkgo biloba, C. A. Shull (*Plant Physiol., 9 (1934), No. 2, pp. 387-389, fig. 1*).—As compared with dicotyledonous, net-veined leaves, those of *G. biloba*, with their dichotomous, parallel veins unconnected, except through the mesophyll cells, present an entirely different problem when the veins are transversely severed. In experiments of this kind, careful measurements from the first uncut vein on either side to the edge of the tissue which was killed showed that the lateral diffusion of water was rapid enough to supply the cells in certain cases to a distance of from 2.6 to 3 mm, the distance apparently depending somewhat on the age and condition of the leaf at the time of cutting and on its position on the tree.

Light and leaf development in Ginkgo biloba, T. T. Li (*Natl. Tsing Hua Univ. [Peiping], Sci. Rpts., Ser. B, 2 (1934), No. 1, pp. 11–27, pls. 4*).—Etiolated seedlings of *G. biloba* about 30 to 40 mm in height were subjected to light intensities of 2, 20, 200, and 2,000 meter-candles, while others, exposed to the diffuse light from a northern window, served as checks. The seedlings at 2 meter-candles were exposed continuously, and at the other light intensities for 12 hr. daily. Three additional sets at 200 meter-candles were exposed, respectively, to 1, 3, and 6 hr. daily. The leaf blade development was ascertained by counting the number of veinlets from the first branch vein and measuring the width and length of the blades with different light intensities and times of exposure. The total length of leaf was also measured and shown to give some indication of the length of the petiole.

The results of this study indicated that both the formative and the extension phases of leaf development in *Ginkgo* require light, its exclusion causing complete arrest of growth. However, the requirement as to intensity differed in the two developmental phases. During the formative phase the light requirement was low, since 2 meter-candles were sufficient to initiate formation of the primordial leaf blade and 200 meter-candles for 12 hr. daily fell within the optimum range for its development. The phase of extension requires stronger light, and different parts of the blade possess different light requirements. For example, the sector containing the first branch vein had a lower light requirement and that containing the last branch vein the strongest. In the sectors containing the first and second branch veins 200 meter-candles were only sufficient to induce significant cellular expansion, while at 2,000 meter-candles normal expansion of the blade occurred. In the latter case the leaf was slightly larger than the check leaves under diffuse sunlight.

As to the effects of length of daily exposure, at 200 meter-candles both 1 and 3 hr. was sufficient to induce development of the primordial leaf, but too short to allow for cellular expansion, while at 6 hr. moderate expansion occurred.

At the various light intensities and times of exposure used, the leaves completed the formative phase within 8 days, and rapid extension began on the eighth day in the light.

With regard to C. Trumpf's contention that Blaauw's law of quantitative stimulus (E. S. R., 23, p. 724) can be applied to the relation of light to leaf development, the author found it applicable only at daily exposures above 3 hr.

The petioles also showed the greatest development at 2,000 meter-candles, being about the same as the checks in diffuse sunlight. The longer the exposure the greater was the growth.

The development of embryo of Ginkgo biloba, T. T. Li (*Natl. Tsing Hua Univ. [Peiping], Sci. Rpts., Ser. B, 2 (1934), No. 1, pp. 29–35, fig. 1*).—Embryos from seeds stored in tight boxes in the laboratory were examined at intervals of 2 weeks, five measurements under the low power of the microscope being made for each, viz, total length, length of cotyledon and of hypocotyl, combined length of radicle and proembryo, and the diameter of the radicle.

The results indicated the development of the embryo to be a continuous process from the time of fertilization (latter part of August) to that of germination. The greater part of the embryonic growth takes place after the seed is detached, but there is no definite time which may be recognized as the maturation period of the whole embryo. In fact, different organs show different maturation periods. The radicle is formed first and also matures first, and it ceases to lengthen when the embryo is about 6.7 mm long. The hypocotyl matures about 2 weeks later, when the embryo is about 7.3 mm long. The cotyledon and plumule have no distinct maturation period. Their growth continues up to germination, but their development is faster immediately after their formation.

Temperature and the development of the Ginkgo embryo, T. T. Li and S. M. Chen (*Natl. Tsing Hua Univ. [Peiping], Sci. Rpts., Ser. B, 2 (1934), No. 1, pp. 37–39*).—The aim of this study was to determine the rate of development of embryos of *G.* [*biloba*] at different temperatures in order, by temperature regulation, to be able to provide seeds ready for germination at all seasons of the year.

On October 8, at which time the embryos were a little over 3 mm long, three seed lots were planted in moist sand and kept (1) in a cork-lined chamber at about 20° C., (2) in an icebox at from 5.5° to 10.5°, and (3) in the soil out of doors. Weekly measurements were made of the embryos in the first lot, and biweekly in the others. Seeds of the first lot began to germinate on November 26, when the average length of the nongerminated embryo was 12.9 mm; seeds of the second lot showed practically no further development of the embryo; and seeds of the third lot began to germinate on April 22, when the average length of the nongerminated embryo was 10.52 mm. It thus appears that ordinary icebox temperatures are entirely practical for the preservation of seeds for later use, and that the time necessary to reach the germination stage is reduced to less than 2 mo. at 20° as compared with 7 mo. in the open.

The development of Ginkgo embryo in vitro, T. T. Li (*Natl. Tsing Hua Univ. [Peiping], Sci. Rpts., Ser. B, 2 (1934), No. 1, pp. 41–52*).—The results of this study indicated that delayed germination of seeds of *G.* [*biloba*] is due to an unripened condition of the endosperm rather than to immaturity of the embryo. When detached from the endosperm and given sufficient oxygen and nutrients, embryos over 3 mm long developed as during normal germination. On the other hand, the endosperm was found to require a certain time for internal adjustment before swelling could take place, i. e., an afterripening process was necessary.

Detached embryos developed in culture media similarly to those germinated normally. The cotyledon and the hypocotyl were the first to show rapid extension, the growth of the radicle occurring later and with greater vigor and continuing longer.

An insufficient air supply proved to be the most important factor in suppressing the growth of young embryos enclosed in the endosperm, since embryos gave a significant growth even in distilled water when sufficiently supplied with air, but only imperceptible growth when submerged in a nutrient solution containing 2 percent of glucose.

Food was shown to be the second most important factor, insufficiencies being most evident in their effects on the growth of the radicle.

Light promoted growth in the cotyledons as in the leaves. In the light cultures chlorophyll developed only in those embryos with free access to air.

When plentifully supplied with air, the embryos in fluid media developed similarly to those in agar media, but the growth rate was slightly higher in the latter case.

The effect of "pantothenic acid" on the growth of the yeast and on the growth of the radical of Ginkgo embryo in artificial media, T. T. Li

and T. SHEN (*Natl. Tsing Hua Univ. [Peiping], Sci. Rpts., Ser. B, 2 (1934), No. 1, pp. 53–60, fig. 1*).—The author's study had the twofold purpose of repeating the experiment of Williams and Saunders (E. S. R., 73, p. 23) on the effects of their growth-promoting substance (pantothenic acid) on yeast and of determining the effects of this substance on the growth of the higher plants, in this case the embryos of *G.* [*biloba*].

Using the methyl alcohol extract of wheat bran, the growth of yeast was very markedly promoted, the effects being progressively intensified with increase in concentration. These results agreed fully with those of Williams and his associates working with similar extracts of rice bran. On the other hand, the methyl alcohol extracts of wheat bran, rice bran, and *Ginkgo* endosperm exerted growth-inhibiting effects on the radicles of young *Ginkgo* embryos in artificial culture at concentrations above 1 mg per cubic centimeter of culture medium. These effects were greatest with the extract of rice bran, less with that of wheat bran, and least with the extract of *Ginkgo* endosperm. The growth inhibition from extracts of wheat bran was less with diluted than with more concentrated solutions. However, at from 0.1 to 0.5 mg per cubic centimeter of medium the extract of *Ginkgo* endosperms exerted a growth-promoting effect on the radicle of young *Ginkgo* embryos in artificial media. At higher concentrations growth-inhibiting effects occurred, and at lower concentrations the effects were indistinct.

Phototropism of decapitated coleoptile of Avena sativa, T. T. LI (*Natl. Tsing Hua Univ. [Peiping], Sci. Rpts., Ser. B, 2 (1934), No. 1, pp. 1–10*).—Contrary to results by H. E. Dolk and others, the author's studies of decapitated coleoptiles of *A. sativa* indicated no loss of protoplasmic irritability. The decrease in the magnitude of phototropic curvature proved to be due to a decrease in the amount of growth substance. When the decapitated coleoptile was exposed solely to unilateral light of 4 meter-candles for 30 min., beginning immediately after decapitation, 39 percent gave a curvature of 10° or more, and 67 percent when the exposure started at 60 min. after decapitation. This increase in curvature was shown to be due to an increase in the production of growth substance during the period of excitability of the decapitated coleoptile. The physiological regeneration concerned only the production of growth substance and bore no relation to phototropic sensitivity.

In decapitated coleoptiles with regenerated tips, the length of presentation time influenced greatly their phototropism. At a 30-min. exposure the minimum light intensity inducing the minimum reaction (i. e., more than 50 percent of the coleoptiles giving a positive curvature of 10° or more) was about 2 meter-candles. The maximum light intensity over which the resulting reaction fell below the minimum magnitude was from 16 to 25 meter-candles. Neither negative nor second positive reactions were observed at light intensities of over 25 meter-candles. Ten min. proved to be too short an exposure to induce the minimum reaction for all light intensities from 2 to 48 meter-candles. With the exposure extended to 3 hr., even 100 meter-candles were able to induce significant positive reaction.

The law of amount of stimulus was found inapplicable to the phototropism of decapitated coleoptiles with regenerated tips.

Stomatal frequency in cereals, E. VAN DE ROOVAART and G. D. FULLER (*Ecology, 16 (1935), No. 2, pp. 278, 279*).—Seedlings of barley, wheat, and corn were grown in pots of soil in which the water supply was kept at known percentages above and below the wilting coefficient. The best plants were produced in soil with the moisture slightly above the wilting coefficient, and such plants had the fewest stomata per unit area. Plants in soil with less moisture had smaller leaves, smaller epidermal cells, and more stomata per unit area.—(*Courtesy Biol. Abs.*)

Observations on the occurrence of air in conducting tracts, F. M. Haines (*Ann. Bot. [London], 49 (1935), No. 194, pp. 367–379*).—"Simple experiments are described for the detection of the presence of air in the superficial conducting tracts of trees. If due precautions be taken, tracheae containing air can be seen as lighter colored streaks on the surface of the wood after the careful removal of the bark. Similar streaks are produced by puncturing the surface of the stripped wood, and so admitting air to the conducting tracts. Very suitable materials are *Sambucus nigra* and *Syringa*, which give most diagrammatic results.

"By the use of this method it is shown that air is sometimes present and sometimes absent from the conducting tracts, the presence or absence largely depending on external conditions. A mechanism must therefore exist for causing bubbles once formed to pass back into solution."

The effect of the rate of flow of air upon assimilation and of fluids upon other natural processes, A. H. Burgess (*Ann. Bot. [London], 49 (1935), No. 195, pp. 567–578, fig. 1*).—During the course of experiments on the drying of hops, the author investigated the effect of air velocity on the time required and found that the same relationship holds for the effect on the rate of drying of hops as on the rate of absorption of carbon dioxide from the air by caustic alkali solutions, on the rate of its absorption by leaves during photosynthesis, and also for the effect of the rate of water flow on the rate of solution of sodium carbonate, copper sulfate, and rock salt. The rate in each case was proportional to the 0.39 power of the velocity of the air or water. Consequently, it appears that the thickness of the "stagnant film" of fluid is inversely proportional to this power of the fluid velocity.

The effect of some cations on the permeability of cells to water, E. C. D. Baptiste (*Ann. Bot. [London], 49 (1935), No. 194, pp. 345–366, figs. 13*).—The author's aim was to establish the change in the permeability to water as the result of previous exposure of cells to the effects of hypotonic solutions of nutritive ions. To this end uniform disks of potato tuber and carrot were used, and the uptake of water was followed by periodical weighings at intervals of 1 min. or less. These disks were soaked overnight in hypotonic solutions of chlorides of K, Na, NH_4, Mg, and Ca, with good aeration. The suction pressure of the disks was then raised to a known uniform level by controlled evaporation over $CaCl_2$, and the uptake of water followed for 5 min. after immersing in distilled water.

The effects of the cations on permeability followed the series $K > NH_4 > Na >$ control $> Mg > Ca$. The differences in the rate of uptake were statistically significant and were shown to be due to permeability changes.

The absolute permeability of the disks to water was calculated, a value of from 150 to 200 cc per square meter, per hour, per atmosphere being obtained. The same value held for uptake as for loss of water.

Comparison of anatomical and histological differences between roots of barley grown in aerated and in non-aerated culture solutions, A. E. Bryant (*Plant Physiol., 9 (1934), No. 2, pp. 389–391*).—This is a preliminary report of a study undertaken at the University of California to determine whether there are any well-defined anatomical or histological differences accompanying the different growth habits of barley roots under these two conditions. The results showed that the tissues in the roots under nonaerated conditions started to differentiate nearer the tip than did those which were aerated. However, beginning at about 25 mm from the tips the cell walls of the roots in the aerated solution started to thicken more rapidly than did those in the nonaerated solution, and in the mature regions of the roots these walls were about twice as thick as the corresponding walls of roots in the nonaerated solution. Further, it has been shown by others working in the same laboratory that the concentration of reducing and total sugars of barley roots grown in aerated culture solutions is less than that of those grown in nonaerated solutions. These differences in structure and sugar content are probably to be explained by the differences in the amounts of oxygen in the two cultures.

Relation between root respiration and absorption, L. HENDERSON (*Plant Physiol., 9 (1934), No. 2, pp. 283–300, figs. 10*).—The author developed and here describes a method for obtaining simultaneous measurements of the respiration and volume absorption of the roots. The carbon dioxide evolution was measured by changes in the pH of the medium in the absence of buffers, and the absorption of oxygen by the micro-Winkler method.

Using seedlings of a pure strain of corn to reduce individual variations, a correlation was shown to occur between the evolution of carbon dioxide, the absorption of oxygen, and the volume absorption of the root system in rain and distilled water, and in Knop's solution. The energy as calculated from the respiratory exchange was 93 percent greater in Knop's solution with an osmotic pressure of 1.75 atmospheres than in pure water. The absorption of water by the roots was accompanied by the expenditure of energy.

Energy absorption by leaves in normal and plane polarized light, R. H. DASTUR and L. K. GUNJIKAR (*Ann. Bot. [London], 49 (1935), No. 194, pp. 273–281, fig. 1*).—An apparatus was devised for measuring the coefficient of absorption in a leaf of the light energy from plane polarized and nonpolarized beams of equal intensities, four percentages of polarization being used. The total light intensity and that transmitted by a leaf in each beam were determined by a microthermopile in terms of the deflection of the galvanometer.

The coefficient of absorption for the leaves of each of 12 species of plants from the polarized and nonpolarized light was determined, a deduction of 20 percent of the total incident energy being made for the loss by reflection from the leaf surface. The coefficients varied from 0.88 to 0.93, and were higher for the polarized than for the nonpolarized light. Transmitted plane polarized light is incapable of reflection from the leaf surface, and therefore the coefficient of absorption of a leaf in polarized light is actually higher than that given.

Metabolism of etiolated seedlings as affected by ammonium nutrition, L. BURKHART (*Plant Physiol., 9 (1934), No. 2, pp. 351–358*).—Since protein regeneration is inhibited in the absence of light, a study of etiolated seedlings would be expected to yield information on the intermediate products of protein metabolism. Accordingly, in this investigation at the University of New Hampshire, the response to ammonium nutrition as influenced by the type and amount of food reserves was studied in etiolated seedlings of *Cucurbita pepo*, *Phaseolus vulgaris*, *Lupinus albus*, and *L. luteus* grown in complete nutrient solutions.

The conditions which resulted during ammonium nutrition here could not be ascribed to acidity. The rates of its absorption and utilization per 100 g of dry kernels apparently depended on the type and amount of nonnitrogenous reserves and varied with the growth stage, and the efficiency of the various species in its utilization also varied considerably. Ammonium nutrition interfered with the utilization of protein and nonnitrogenous reserves. Protein regeneration or formation favored by the ammonium did not occur at the expense of reserve proteins.

There was but little evidence favoring the view that amides serve as efficient detoxicants of ammonia. The resistance to ammonium injury was apparently governed by the type and amount of nonnitrogenous reserves in the seed, and the type of the injury differed in the various species used. Considerable accumulation of ammonia and a low concentration of reducing sugars were associated with ammonium injury, but their significance in this connection needs elucidation.

Seedlings can be classified with respect to their responses to ammonium salts only after much further investigation.

The structure of the starch layer in the glossy petal of Ranunculus.—II, The British species examined, J. Parkin (*Ann. Bot.* [*London*], *49* (*1935*), *No. 194, pp. 283–289, figs. 9*).—It is shown that no slanting of the starch cells occurs in at least 4 species, a slight slope in 2, and a decided or pronounced slope in 6 species. The slope is regarded as a derived rather than a primitive feature, and it is suggested tentatively that it may be initiated when the starch cells tend, during evolution, to assume a palisade character. A pull during development by the extension of the adjacent cells lengthwise might then cause the obliquity. The tendency in the genus has probably been to increase the opacity and thus the color intensity of the petal by deepening the starch layer.

Regeneration in monocotyledonous seedlings, C. D. La Rue (*Amer. Jour. Bot.*, *22* (*1935*), *No. 4, pp. 486–492*).—Regeneration of shoots or development of adventitious roots, or both, occurred in variously mutilated seedlings of some, though not all, members of the grass family, but none in other monocotyledons tested. Excised roots of all plants tested proved incapable of regeneration.

Auxin, the plant growth-hormone, F. W. Went (*Bot. Rev.*, *1* (*1935*), *No. 5, pp. 162–182, fig. 1*).—This general critical review includes discussions of the history and methods of the study of auxins (growth substances), their sources, types, chemical composition, formation, properties, transport within the plant, mechanism of action, effects on roots v. aerial parts of plants, and their role in plants v. animals. The literature list comprises 82 titles.

The effect of auxins upon Phytophthora cactorum, L. H. Leonian (*Jour. Agr. Res.* [*U. S.*], *51* (*1935*), *No. 3, pp. 277–286, figs. 4*).—In studies at the West Virginia Experiment Station, canned peas induced excellent growth and reproduction in *P. cactorum*, but when their ash was added to a mineral solution plus a pure grade of dextrose the fungus failed to grow. However, when a piece of root about 1 in. long, cut from an aseptically sprouting corn grain, was added to the same solution the fungus grew well and reproduced normally. Even as short an exposure as 1 min. endowed the solution with growth-promoting properties, but the growth was richer with longer exposures.

The growth-promoting substances in the root moved toward the base, so that only small amounts were given off from the apical part when the root was cut off. The amount given off from the sound roots was negligible. These substances as given off by the cut root failed to induce growth in the absence of the essential salts and sugar. Not only living but also crushed or autoclaved roots induced excellent growth, and many toxic substances and protein precipitants and X-rays failed to exert any harmful influence on the growth-promoting substances.

Growth-promoting factors were adsorbed on norite, but the sexuality-promoting substances were not. This would seem to indicate that there are sexuality-promoting factors differing in chemical and physical properties from the growth-promoting substances.

In the light of the results obtained, the author believes the growth-promoting substances in corn roots to be auxins.

The soil as a direct source of carbon dioxide for ordinary plants, B. E. LIVINGSTON and R. BEALL (*Plant Physiol., 9 (1934), No. 2, pp. 237–259*).—The authors present a comprehensive review of the literature, including 45 references, and then detail a preliminary series of experiments with potted plants in the greenhouse to test the relation of growth to the carbon dioxide content of the culture soil.

"An unusually high concentration of CO_2 was maintained in the soil mass of some pots by diffusion from a porous-porcelain cone continuously supplied with CO_2 from a specially devised generator, and the plants so treated were generally more vigorous than the corresponding untreated ones. Growth acceleration concomitant with this CO_2 treatment was very pronounced for plants of *Lupinus albus*, less pronounced for a green form of *Coleus blumei* and for *Lycopersicum esculentum*, slight for *Dracaena sanderiana*, and absent for a dark red form of *C. blumei*. Attention is called to the probability that these growth responses may not have been due wholly to accelerated absorption of CO_2 from the soil, for the CO_2 treatment doubtless involved other differences between treated and untreated cultures. Arrangements were such as to promote very free air circulation around all the plants to avoid the possibility of a higher concentration of CO_2 in the air around the leaves of the treated plants than in the air around the leaves of the others."

The duplication system in the doubling of Malus halliana and Prunus serrulata, Y. IMAI (*Jour. Col. Agr., Imp. Univ. Tokyo, 13 (1934), No. 1, pp. 1–7, pl. 1, figs. 3*).—This study showed doubling in *M. halliana* to be due chiefly to petalomany, which occurred as a primary duplication. An imperfect secondary duplication was seen in only a few flowers. The correlation coefficient for the numbers of petals and stamens (+0.008±0.021) showed no definite relationship between them.

In Kôfugen, a subform of *P. serrulata lannesiana*, duplication due to petalomany rose to the fifth degree, though such an occurrence is very rare. Each duplication added 10 petals to flowers with 5 sepals. The correlation coefficient for the numbers of petals and stamens (—0.670±0.017) showed a high degree of negative relationship.

Enzyme or living entity? [trans. title] H. BECHHOLD (*Kolloid Ztschr., 66 (1934), No. 3, pp. 329–340, figs. 4; 67 (1934), No. 1, pp. 66–79*).—The author critically reviews present knowledge, including the results of his own studies relative to the nature of the viruses, including data on the sizes of the particles, with special reference to methods of determination (ultraviolet photomicrography, ultrafiltration, and centrifugation) and to the sizes of these particles in various bacteriophages and in some nine specific viruses causing diseases in plants and in animals.

The size determinations reviewed and accepted as proved show an almost unbroken series from below the limits of microscopically visible and depictable micro-organisms, the bacteria, viz, from around 500 mμ up to subvisible bodies 20 mμ (the smallest bacteriophages and some pathogenic viruses) in diameter. On the basis of size, it would not be difficult to determine whether a virus of 120 mμ diameter (fowl plague, canary virus) should be considered an organism or an enzyme. For bodies of 20 mμ diameter, as in certain phages and viruses, the problem is more difficult. However, if, in the unbroken series, certain phages and viruses of 200 mμ diameter are within the size limits of living entities, it is scarcely admissible to ascribe to them an organic nature while assuming an enzymic nature for others with similar properties but smaller size (phages and viruses, e. g., of 75 or 90 mμ diameter).

All forms studied by the author were, among themselves, uniform in size, as are such organized bodies as blood corpuscles, bacteria, etc., and also molecules. A substance built up of uniform molecule groups is larger or smaller according as more or fewer molecules of like kind enter into its structure, but if bodies which are not capable of molecular subdivision are of uniform size, it seems clear that they are not chemical substances but, rather, organized bodies. When such formed, organized bodies are reproduced from generation to generation with like structure, size, and functions, it is scarcely possible to do other than ascribe to them the nature of autonomously reproducing living entities in the true sense.

Culturing of viruses in the absence of living cells has thus far been unsuccessful. They behave like obligate parasites.

It is believed that a living entity of 20 mμ diameter is by no means unthinkable. Various protein molecules have a diameter of about 5 mμ. In a body of 20 mμ diameter at least 60 such molecules could take part, and a fairly complicated mechanism could be ascribed to it. In any case, such dimensions do not preclude an organic nature in viruses of such size.

Investigations have shown that virus bodies of 220 mμ diameter or smaller are of great similarity in form. Logically, elongated form presupposes structural elements of similar form, as in certain supporting tissues of higher plants and animals. In this connection, it is felt perhaps not too venturesome to assume that in such minute primitive bodies as the viruses there is not room for such form-delimiting structural substances (cellulose, fibrin, and collagen), which play only a secondary role in assimilation and dissimilation. On the other hand, the subvisible viruses plainly contain proteins known to be important to life (albumins, globulins, etc.) and which are also known to be spherical in form.

Other virus properties, both demonstrated and hypothetical, and comparisons with known micro-organisms are discussed. On the basis of the chemical, physical, biological, and logical data at hand, the author favors the hypothesis that the viruses, including the bacteriophages, are living entities rather than of enzymic nature.

Studies of enzyme action in sugar cane.—I, The characteristics of enzymes and their importance in the growth and nutrition of plants, C. E. Hartt (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 39 (1935), No. 3, pp. 171–179*).—This is a nontechnical account of enzymes and enzyme activity in plants introductory to an expected later presentation of the results of the author's studies on enzymes in sugarcane as affected by the use of fertilizers and by other conditions.

Effect of high frequency sound waves on oxidase activity, R. J. Christensen and R. Samisch (*Plant Physiol., 9 (1934), No. 2, pp. 385, 386, fig. 1*).—Fruit extracts (apricots, peaches, and avocados) containing oxidase were exposed in glass bulbs to supersonic waves of 450,000 cycles in the air, and in a continuous stream of hydrogen or nitrogen. The oxidase activity, measured by oxygen absorption of catechol, decreased logarithmically over a period of from 6 to 12 hr. whether conditions were aerobic or anaerobic. The temperature never rose above 38° C., and neither temperature rise nor production of hydrogen peroxide can explain the destructive effects of the supersonic waves.—(*Courtesy Biol. Abs.*)

The quantitative determination of micro-organisms, including a new method for general use [trans. title], E. Reimesch (*Zentbl. Bakt. [etc.], 2. Abt., 91 (1935), No. 22–26, pp. 460–468, fig. 1*).—Of the common procedures employed, the centrifuge method is best suited to general purposes. The new method makes use of capillary tubes with parallel walls, in which the sediment of micro-organisms is read off directly on the fluid surface deposited in the tube with a horizontal microscope and ocular micrometer.

Studies on anaerobic bacteria.—II, Further extensive uses of the vegetable tissue anaerobic system, L. S. McClung, E. McCoy, and E. B. Fred (*Zentbl. Bakt. [etc.], 2 Abt., 91 (1935), No. 11–15, pp. 225–227*).—In this contribution from the University of Wisconsin, some of the further uses of this anaerobic system cited are (1) single colony purification of anaerobic sporiferous bacilli, (2) as incubation jars to accommodate 200–300 plates, (3) production of antigen by surface growth for mass immunization of laboratory animals, (4) production of mass quantities of bacterial cells for enzyme studies, (5) incubation of large numbers of tubes in differential sugar fermentation studies, and (6) incubation of hundreds of plates necessary in studying the enzymic system of cultures.

The method proved practical at both thermophilic and mesophilic temperatures. Its advantages and disadvantages are discussed.

Studies on anaerobic bacteria.—VIII, The agglutination reactions of Clostridium thermosaccharolyticum, L. S. McClung and E. McCoy (*Zentbl. Bakt. [etc.], 2. Abt., 91 (1935), No. 11–15, pp. 228–231*).—In this study from the University of Wisconsin, application of the technic using stabilotropic and labilotropic antigens revealed two groups of cultures. A strain typical of one group was deficient in the "H" factor of the "master strain", typical of the other group. The presence of heat-labile and heat-stabile antigens was demonstrated in *C. thermosaccharolyticum*, this being the first instance of this type of study in the species or in a thermophilic organism. The agglutination reaction was successfully applied in the species identification of an anaerobic bacillus.

A microscopic method of distinguishing dead from living bacterial cells, G. Knaysi (*Jour. Bact., 30 (1935), No. 2, pp. 193–206*).—This contribution from Cornell University is concerned with the use of neutral red for microscopically distinguishing between dead and living cells, *Escherichia coli* and *Schizosaccharomyces pombe* being the test organisms used.

GENETICS

Statistical methods for research workers, R. A. Fisher (*London: Oliver and Boyd, 1934, 5 ed., rev. and enl., pp. XIII+319, figs. 12*).—A revised edition of this book, especially bringing in additional methods and explanations for testing significance.

A table for transforming the correlation coefficient, r, to z for correlation analysis, H. H. Love (*Jour. Amer. Soc. Agron., 27 (1935), No. 10, pp. 807–812*).—This contribution from Cornell University sets forth a table for transforming the correlation coefficient, *r* to *z*, for use in correlation analysis in accordance with the methods presented by Fisher (see above).

Cytology and fruit breeding.—II, What is a chromosome? B. R. Nebel (*Farm Res. [New York State Sta.], 2 (1935), No. 1, pp. 7, 9, figs. 2*).—This, the second part of a general discussion (E. S. R., 73, p. 598), presents information on the structure and behavior of the chromosomes, using as illustrative material those of the spiderwort, a plant characterized by unusually large chromosomes.

A chromosomal interchange in maize without ring formation, A. E. Clarke and E. G. Anderson (*Amer. Jour. Bot., 22 (1935), No. 8, pp. 711–716, figs. 2*).—The partially sterile strain of corn described from studies of the University and the Institute of Technology of California does not form a ring at diakinesis but differs from the stocks of Burnham and of Brink and Cooper by frequently producing 10 separate pairs of chromosomes instead of 8 pairs and a chain of 4. Study of pachytene figures showed that the satellite chromosome and the third longest chromosome (carrying the *a*–ts_4 linkage group) are involved. Observations on diakinesis figures and on pollen are discussed briefly.

Heteromorphic A chromosomes of the tomato differing in satellite size, M. M. and J. W. Lesley (*Genetics, 20 (1935), No. 6, pp. 568–580, pls. 2*).—Cytological studies by the California Experiment Station at Riverside showed that the A chromosomes of the cultivated tomato are associated with the nucleolus and are of two types, long and short, differing only in satellite size. All the wild races examined, such as *Lycopersicum pimpinellifolium*, had short A chromosomes. Diploid F_1 hybrids from long long × short short had a short and a long A chromosome. In the F_2 generation short short, long short, and long long types occurred in the ratio of 1:2:1, yet the three types were phenotypically similar, indicating that the satellites are genetically inert. At the pachytene the satellites were found pycnotic and loosely paired, but could not be distinguished at diakinesis. Both cytological and genetical evidence indicated that long and short A chromosomes are homologous, with no tendency for either to associate with any other chromosome.

Chromosomes in the banana, [I], II [trans. title], E. A. Graner (*Rev. Agr. [Brazil], 9 (1934), No. 7–8, pp. 333–340, pls. 2, figs. 5, Eng. abs., p. 338; 10 (1935), No. 3–5, pp. 149–151, pl. 1, Eng. abs., p. 150*).—According to the first of these contributions, there were found 22 and 33 somatic chromosomes, respectively, in the seed-bearing *Musa textilis* and the seedless *M. cavendishi* plants growing in the Rio de Janeiro Botanical Garden. In the second contribution the author reports finding 33 somatic chromosomes in the root tips of the Maçã and Figo varieties and 22 in the Ouro variety.

Morphological and cytological studies on Fagopyrum esculentum, K. L. Mahony (*Amer. Jour. Bot., 22 (1935), No. 4, pp. 460–475, pls. 2, fig. 1*).—This reports the results of a morphological and cytological study of the development of the ovule and of the fertilization process in buckwheat. The haploid number of chromosomes proved to be eight.

On haplophase and diplophase in some Saccharomycetes, Ö. Winge (*Compt. Rend. Lab. Carlsberg, 21 (1935), No. 4, pp. 77+112, pls. 3, figs. 16*).—Studies of four yeasts, *Saccharomyces* (*ellipsoideus*) *f. johannisberg II*, *S. ellipsoideus*, *S. validus*, and *S. marchalianus*, showed that the typical vegetative phase in all four was constantly diploid and able to form asci under suitable conditions. Single haploid ascospores on germination may fuse in pairs, giving rise to the diploid stage immediately, or that they may produce, by budding, groups of dwarf cells capable of fusing either with each other, with the parent ascospore, or with another ascospore, or a haploid cell derived therefrom, to form a diploid zygote capable of producing typical, rapidly growing, normal-sized diploid vegetative cells.

The completion of meiosis by complete non-synapsis [trans. title], F. Brieger (*Ber. Deut. Bot. Gesell., 52 (1934), No. 3, pp. 149–153*).—Non-synapsis was studied during the formation of microspores in hybrids of *Nicotiana*, including *N. rusbyi* (12) × *N. sylvestris* (12), *N. rusbyi* (12) × *N. glutinosa* (12), *N. tomentosa* (12) × *N. sylvestris* (12), *N. tabacum* (24) × *N. glauca* (12), *N. tabacum* (24) × *N. glutinosa* (12), and *N. tabacum* (24) × *N. rustica* (24). These hybrids showed almost complete non-synapsis during meiosis, and the process was practically the same in all.

Meiosis in Lilium, K. Mather (*Cytologia, 6 (1935), No. 2–3, pp. 354–380, figs. 10*).—At the John Innes Horticultural Institution *L. pyrenaicum*, *L. regale*, *L. candidum*, *L. umbellatum*, and *L. speciosum* were found to be of diploid chromosomal structure. *L. tigrinum* was triploid and *L. henryi* and *L. japonicum* diploid, with additional fragments which were shown to be reduplications and to have a chiasma frequency proportional to their length. *L. tigrinum* was autotriploid with chromosomes in the form of trivalents and a small number of bivalents and univalents at meiosis. The author concludes that specific differentiation in *Lilium* has been attained by genic or minor structural changes within the chromosomes.

Artificial parthenocarpy, J. H. Schaffner (*Jour. Heredity, 26 (1935), No. 7, pp. 261, 262, fig. 1*).—The removal of all the large leaves from a solitary vigorous carpellate *Carica papaya* plant growing in the greenhouse of Ohio State University resulted in the development of seedless fruits.

Heritable characters of maize, XLVIII, XLIX (*Jour. Heredity, 25 (1934), No. 5, pp. 191–193, fig. 1; 26 (1935), No. 6, pp. 249–251, figs. 2*).—The series (E. S. R., 71, p. 178) is continued.

XLVIII. *Dwarf$_6$*, W. H. Eyster.—A dwarf type of corn (d_6) inherited as a simple recessive is characterized in the mature plant by lower leaves extending upward at a sharp angle from the stem and the uppermost leaves rolled about each other, often completely enclosing the tassel. Linkage was shown with purple aleurone (*pr*) with about 19 percent crossing over, with brown midrib (*bm*) 8 percent crossing over, and with yellow stripe (*ys*) with over 18 percent crossing over. Other studies showed genes for brown midrib and purple aleurone to be linked with about 24 percent crossing over. d_6 lies between *pr* and *bm* on chromosome 5 in the order *pr*–d_6–*bm*–*ys*.

XLIX. *Pale midrib*, R. A. Brink.—A new gene in corn, pale midrib (*pm*), which causes a reduction in the amount of chlorophyll along the midrib and in the sheath of the leaf, is reported from the Wisconsin Experiment Station. Pale midrib is readily distinguished from the allelomorphic condition and shows satisfactory viability. The *pm* gene lies in the A_1–Rg_1 linkage group (chromosome 3), and shows 33 percent crossing over with *na* (nana) and 8 percent with Rg_1 (ragged-1). The gene order is *na*–*pm*–Rg_1.

The cytogenetics of maize, M. M. Rhoades and B. McClintock (*Bot. Rev., 1 (1935), No. 8, pp. 292–325, figs. 3*).—"Cytogenetics may be defined as the correlation of cytologically observed conditions with genetic data." This contribution from Cornell University presents several of the more pertinent facts discovered in cytogenetic investigations with corn under the topics of the location of genes within the chromosome, crossing over, rearrangements of parts of chromosomes, factors affecting meiotic chromosome association, and aneuploidy and euploidy. Some of the outstanding contributions in the work are summarized briefly with a glossary and a list of 64 references to literature cited.

The genetics of cotton, XII–XIV, S. C. Harland (*Jour. Genet., 30 (1935), No. 3, pp. 465–476, pl. 1; 31 (1935), No. 1, pp. 21–26, pls. 3; pp. 27–37*).—The series (E. S. R., 72, p. 309) is continued.

XII. *Homologous genes for anthocyanin pigmentation in New and Old World cottons.*—The gene *R* from *Gossypium arboreum* ($n=13$) was transferred to *G. hirsutum* (26) successfully by means of several backcrosses, during which the initial high sterility was modified ultimately to complete fertility. In the *G. arboreum* genotype *R* produced the character complex red plant, red flower, and intense petal spot, while in the *G. hirsutum* genotype, *R* involved a great reduction in intensity of red coloration in the plant and the flower and disappearance of petal spot. In the Asiatic group of Gossypiums, *R* evidently is accompanied by a group of modifiers whose combined effect is to enhance manifestation of anthocyanin pigmentation, while *G. hirsutum* either lacks such modifiers altogether or carries a neutralizing or diluting set of modifiers in the other 13-chromosome subgenom.

"The *R* already established to be a member of a multiple allelomorphic series of factors conditioning anthocyanin pigmentation in the Asiatic group is most probably a new allelomorph in a similar multiple allelomorphic series characterizing the New World group. The theory of Skovsted [E. S. R., 71, p. 457] that the New World $n=26$ group is amphidiploid with one subgenom homologous with the $n=13$ Asiatic species *G. arboreum* and *G. herbaceum* is thus strengthened by genetic evidence." The present geographical distribution of the Asiatic and New World groups suggests that the New World amphidiploids arose during late Cretaceous or early Tertiary times.

XIII. *A third series of experiments with the Crinkled Dwarf mutant of G. barbadense L. The cross barbadense crinkled×hirsutum crinkled.*—*G. hirsutum* crinkled (Type 9)×*G. barbadense* crinkled gave in F_2 a series of crinkleds ranging from an extreme and exaggerated type (supercrinkled) to a type phenotypically normal (pseudonormal). Several new crinkled types were extracted in homozygous form in later generations. *G. barbadense* and *G. hirsutum* seem to possess dissimilar modifier complexes, which in the interspecific cross are broken down, leading to production of a varying series of genotypical backgrounds upon which the crinkled mutant is manifested in a corresponding series. Conversion of the crinkled mutant to pseudonormal by genic recombination resulting from the interaction of *G. barbadense* and *G. hirsutum* modifiers favored Fisher's view (E. S. R., 62, p. 28) that recessives may ultimately become merged in the wild type by accumulating modifiers.

XIV. *The inheritance of brown lint in New World cottons.*—The inter-*G. barbadense* cross, Egyptian brown×Sea Island white, gave F_1 intermediate and complicated segregation of the blending type in F_2. This seemed due to the fact that factor K^B of the brown parent accompanied a number of plus modifiers absent in the white parent. Repeated backcrossing of heterozygotes to the brown parent equalized the plus modifiers of both dominant and recessive phases of K^B. Selfing after 3 backcrosses gave simple segregation into 3 brown: 1 light brown. Lint color and lint length were correlated negatively, K^B or a factor closely linked to it conditioning a shortening in lint length of about 5.1 mm in the homozygous and 2.7 mm in the heterozygous phase. Minor color factors also were correlated with variations in lint length. The blending type of inheritance of brown lint in Egyptian×Sea Island appeared due to disintegration by human agency of an original brown-lint factor complex. Brown *G. barbadense*×brown *G. hirsutum* was found to involve duplicate genes for lint color. The distribution of known pairs of duplicate genes in *G. barbadense* and *G. hirsutum* is discussed.

Cytological studies in cotton.—III. A hybrid between Gossypium davidsonii Kell. and G. sturtii F. Muell., A. Skovsted (*Jour. Genet., 30 (1935), No. 3, pp. 397–405, pls. 2, figs. 9*).—The third number in this series (E. S. R., 71, p. 457) reports that *G. davidsonii* (*n*-13) has smaller chromosomes than *G. sturtii* (13), this difference being maintained in their hybrid and enabling a distinction between paternal and maternal chromosomes. Chromosome pairing in the hybrid is incomplete,, but allosyndesis occurs about 9 times as often as autosyndesis. Univalents are as frequent between chromosomes from *G. davidsonii* as between those from *G. sturtii*. Chiasma frequency is the same in the pure species despite difference in chromosome size, while in the hybrid it is significantly smaller in bivalents containing a *G. davidsonii* and a *G. sturtii* chromosome.

Some new interspecific hybrids in the genus Gossypium L., A. Skovsted (*Jour. Genet., 30 (1935), No. 3, pp. 447–463, fig. 1*).—Hybridization experiments were made at the Cotton Research Station in Trinidad between the following groups (with the exception of the last 2 groups): *G. aridum* (*Erioxylum*), *G. armourianum*, *G. davidsonii*, *G. trilobum*, *G. sturtii*, *G. stocksii*, *G. anomalum*, Asiatic cottons, and New World cottons. Positive results are shown diagrammatically.

Within species with 13 chromosomes, Asiatic cottons, *G. anomalum*, and *G. stocksii* form one group; *G. armourianum* and *G. aridum* another; and *G. trilobum* probably occupies an intermediate position. Apparently *G. davidsonii* and *G. sturtii* represent 2 separate side-groups. Hybrids between New World cottons ($n=26$) and the species ($n=13$) are usually much easier to produce than hybrids between the species ($n=13$). The 3 hybrids found sufficiently fertile to afford material of use to the practical plant breeder all have $2n=39$, the parental species being New World cottons ($n=26$) and the wild species *G. aridum*, *G. armourianum*, and *G. trilobum* ($n=13$) from America. A haploid *G. davidsonii* was obtained in hybridization experiments with *G. trilobum*. Further reasons for the inclusion of *Thurberia* and *Erioxylum* in *Gossypium* are advanced.

Petalody in cotton, V. Ramanatha Ayyar and R. Sankaran (*Indian Jour. Agr. Sci., 4 (1934), No. 6, pp. 938–942, pls. 2*).—A type of petalody was found in Karunganni cotton (*Gossypium indicum*), in which a few fertile pollen grains were present with the stigma devoid of hairs, the lobes separate, and the ovules apparently fertile. In crosses with normal flowers, the normal condition was dominant in F_1 and later generations with a single factor difference (F^{pd} f^{pd}) indicated. In a second type found in *G. cernuum* × *G. indicum*, petalody was weak and the anthers entirely contabescent, but no bolls developed even with artificial pollination. The ovules seemed to be functionally sterile.

Research on Aegilops-Haynaldia and Triticum-Haynaldia hybrids [trans. title], E. Oehler (*Ztschr. Induktive Abstam. u. Vererbungslehre, 68 (1935), No. 2, pp. 187–208, figs. 9*).—Seed set averaged 3.55 percent when 15 species of *Aegilops* were crossed with *H. villosa* (*T. villosum*) and 1.62 when 6 species of *Triticum* were crossed with *Haynaldia*. While most of the characters were intermediate, characteristics of *Aegilops* and *Triticum* usually were more dominant in their respective hybrids with *Haynaldia*. All hybrids bloomed with closed anthers. The morphology and fertility relations of the several hybrids are described.

A trigeneric hybrid of Zea, Tripsacum, and Euchlaena, P. C. Mangelsdorf and R. G. Reeves (*Jour. Heredity, 26 (1935), No. 4, pp. 128–140, figs. 6*).—The cytological and genetic studies of *Zea* × *Tripsacum* (E. S. R., 67, p. 513) reported from the Texas Experiment Station indicated that it produces only unreduced gametes with the somatic chromosome number. Crossing this hybrid with *Euchlaena* produced a triple hybrid having a complete chromosome complement from each of the three genera. At the meiotic division in this triple hybrid complete pairing of 10 *Zea* chromosomes with 10 *Euchlaena* chromosomes with all the *Tripsacum* chromosomes behaving as lagging univalents was observed. The hybrid usually exhibits any character common to two of the three genera, two doses of a condition being usually dominant to one dose of the alternative condition. The phyletic significance of this hybrid and the genetic and cytological importance of complex hybrids are discussed.

Inheritance of some plant characters in cabbage, Brassica oleracea var. capitata, C. C. Kwan (*Jour. Agr. Assoc. China, No. 126–127 (1934), pp. 81–127, pls. 2; Chinese abs., pp. 125–127*).—In this doctorate study at Cornell University there were used in crossing experiments three pure inbred lines, purple, sun red, and green in color. Deep purple × sun red gave an F_2 ratio of 15 purple to 1 sun red, whereas deep purple × green yielded an F_2 ratio of 9 purple, 3 sun red, and 4 green. To reconcile the two ratios the author suggests that the two sun red types were possibly different in genetic nature. Wrinkled foliage is believed due to two complementary factors, with possibly accessory factors affecting the degree of wrinkling. No indication of linkage was observed between foliage types and plant color in the cross purple × sun red. Head weight and also plant height showed hybrid vigor in the F_1 generation. There was no evidence of linkage between foliage type and plant height, between plant color and height, or between plant color and head weight.

A gene for control of interstitial localization of chiasmata in Allium fistulosum L., S. L. Emsweller and H. A. Jones (*Science, 81 (1935), No. 2109, pp. 543, 544*).—Of 17 plants obtained by the University of California at Davis from back-crosses of a hybrid, *A. cepa* × *A. fistulosum*, to both parents, 10 had interstitial and 7 terminal chiasmata. When the plants were arranged in order of their fertility it was noted that the most fertile all had localized chiasmata. There was a complete lack of correlation between the percentage of good pollen and fertility. The suggestion is offered that the type of chiasmata may be gene controlled, and that the 10 plants with interstitial chiasmata are homozygous recessives.

Studies on the hypophysectomized ferret, IV–IX (*Roy. Soc. [London], Proc., Ser. B, 113 (1933), No. 785, pp. 530–544, pls. 3; 114 (1933), No. 787, pp. 124–135, pl. 1; 117 (1935), No. 802, pp. 34–45, pls. 2*).—Continuing this series (E. S. R., 69, p. 34), the results of the following studies are briefly reported:

IV. *Comparison of the reproductive organs during anoestrus and after hypophysectomy*, M. Hill and A. S. Parkes.—Hypophysectomy in the ferret during anestrum was found to inhibit the subsequent onset of the changes associated with the breeding season. As the atrophic condition of the reproductive organs was only slightly accentuated, it is assumed that the pituitary body is only slightly active during the anestrous period.

V. *Effect of hypophysectomy on the response of the female ferret to additional illumination during anoestrus*, M. Hill and A. S. Parkes.—As the induction of estrum by illumination in the castrated female ferret was inhibited by hypophysectomy, it is considered that the stimulation by light acts on this organ.

VI. *Comparison of the response to oestrin of anoestrous, ovariectomized and hypophysectomized ferrets*, M. Hill and A. S. Parkes.—Injection of estrin into female ferrets indicated that there was no essential difference in the response between normal anestrous animals, ovariectomized anestrous animals, and hypophysectomized anestrous ferrets.

VII. *Inhibition of ovulation in the mated oestrous ferret*, M. K. McPhail.—Hypophysectomy of the ferret as early as from 46 to 60 min. after the beginning of coitus inhibits the ovulation which normally follows copulation.

VIII. *Effect of administration of anterior lobe extract, prolan, and the two combined*, M. K. McPhail.—The administration to hypophysectomized ferrets of anterior pituitary extract alone caused thecal luteinization of small follicles; whereas, the administration of prolan alone caused many follicles to undergo partial growth which terminated in atresia, thecal luteinization being rare or absent. The administration of both extracts simultaneously resulted in luteinization and not in follicular growth. Increased doses failed to produce estrum or maintain the partial development induced.

IX. *The effect of hypophysectomy on pregnancy and lactation*, M. K. McPhail.—Hypophysectomy of pregnant ferrets resulted on the twenty-first day of gestation in abortion or resorption of the fetuses in 3 out of 4 cases. Of 6 ferrets hypophysectomized at the thirty-fifth day of gestation, 4 had premature litters and only 2 went to term. Lactation failed to occur, and the mammary glands showed no development.

An anterior lobe extract was administered to 3 animals hypophysectomized on the thirty-fifth day of gestation. One aborted, and in the others parturition occurred on the forty-second and forty-fourth days. The mammary glands hypertrophied and secreted milk. Lactation stopped in 2 days in a female hypophysectomized 20 days after parturition.

The quantitative and qualitative ovarian response to distributed dosage with gonadotropic extracts, L. C. Maxwell (*Amer. Jour. Physiol., 110 (1934), No. 2, pp. 458–463*).—By the administration of beef and sheep pituitary preparations and pregnancy urine to female rats from 21 to 23 days old, it was ascertained that the response was greatly exaggerated by distributing the dose at several intervals each day and by the addition of zinc salts which retarded absorption of the active principle.

Further studies of the effects of the estrogenic and the galactopoietic hormones upon the mammary gland of the rabbit, W. U. Gardner, E. T. Gomez, and C. W. Turner (*Amer. Jour. Physiol., 112 (1935), No. 4, pp. 673–683, figs. 9*).—Further studies at the Missouri Experiment Station of the influence of galactin on mammary gland development and lactation with 43 immature and mature castrated virgin female, castrated multiparous, and normal and castrated male rabbits showed that a period of theelin treatment in excess of 10 days was required before the mammary glands of rabbits not in estrum or recently ovariectomized during estrum would respond to galactin. If the secretory activity of the glands is established, the galactin must be administered within 3 days after the cessation of theelin injections.

The effect of lactogenic hormone preparations on the blood sugar level of rabbits and monkeys, W. O. Nelson, C. W. Turner, and M. D. Overholser (*Amer. Jour. Physiol., 112 (1935), No. 4, pp. 714–717*).—At the Missouri Experiment Station, treatment of 4 monkeys and 13 pseudo-pregnant and 6 estrous rabbits with lactogenic hormone relatively free from other pituitary principles, brought about no significant alteration in the blood sugar level.

Some influences of oestrin on the hypophyseal-gonad complex of the immature female rat, C. E. Lane (*Amer. Jour. Physiol., 110 (1935), No. 3, pp. 681–685, figs. 4*).—As determined by the effects of pituitary implants from estrin-injected female rats on the ovaries of normal 22-day-old rats, in which the hypophysis from the injected animals were implanted, it appeared that the estrin injections at first stimulated hypophysis to liberate an excess of gonadotropic hormones. Later there was an inhibition in the secretion of the follicle-stimulating hormone, and still later a failure of this hormone to be produced. A luteinizing substance was evidently secreted in an excessive amount.

The quantitative determination of urinary oestrin, G. Van S. Smith and O. W. Smith (*Amer. Jour. Physiol., 112 (1935), No. 2, pp. 340–350, figs. 2*).—Quantitative tests of the estrin of pregnancy urine showed that the most consistent and largest quantities were obtained from urine boiled from 5 to 10 min. with 15 percent of HCl and extracted with benzene.

Pregnancy urine given by mouth to gonadectomized rats: Its effect on spontaneous activity and on the reproductive tract, C. P. Richter (*Amer. Jour. Physiol., 110 (1934), No. 2, pp. 499–512, figs. 4*).—The usual marked decrease in voluntary activity in male and female rats which follows gonadectomy was prevented by the administration of pregnancy urine supplied in the drinking water. The reproductive tract of the female was maintained in the normal condition, but the atrophy of the sex organs of the male, which followed castration, was not prevented.

Results of a rabbit ovulation test for equine pregnancy, J. J. Arnold (*Michigan Sta. Quart. Bul., 18 (1935), No. 1, pp. 46–48*).—Study was made of the use of the rabbit ovulation test for diagnosing pregnancy in mares from blood samples injected intravenously into rabbits. Only 3 of the 33 tests were erroneous when at least 1 cc of blood serum (drawn from mares from 47 to 82 days after breeding) was injected. The rabbit ovulation test did not give positive results up to and including the forty-sixth day of gestation.

Voluntary control of sex, S. R. Mulder (*Over willekeurige beinvloeding van de geslachtsverhouding. Proefschr., Rijks-Univ., Utrecht, 1935, pp. [9]+102, figs. 7*).—Data are reported on the acidity of the genital tract and the semen from rabbits, rats, sheep, and cattle. Attempts to control sex by changing the pH of the vagina have been negative, as were also attempts to separate male- and female-producing sperm by cataphoresis.

FIELD CROPS

Effect of alfalfa and farm manure on yields of irrigated crops in the Great Plains, S. H. Hastings (*U. S. Dept. Agr., Tech. Bul. 483 (1935), pp. 40*).—The results of rotation experiments concerned with the effects of farm manure and alfalfa upon subsequent yields of sugar beets, potatoes, and oats, obtained 1912–32 at the Belle Fourche (S. Dak.), Huntley (Mont.), and Scotts Bluff (Nebr.) Field Stations, are analyzed as a whole and by 7-yr. periods, with a discussion of the relative merits of manure and alfalfa and remarks on agricultural conditions of the region and the rotations and cultural practices used. Progress results on these and related investigations have been noted (E. S. R., 40, p. 421; 44, p. 33; 49, p. 328; 66, p. 730; 68, p. 323; 69, p. 789; 72, p. 759).

At all 3 stations manure increased the yields of sugar beets materially, the maximum increase amounting to 11.2 tons per acre, but increase in beet yields due to inclusion of alfalfa in the cropping system were not consistent except at Scotts Bluff. At the other stations 2 yr. of alfalfa increased beet yields in only a few instances. During the last 7 yr. manure proved superior to alfalfa in every instance, yield increases ranging from 1.5 to 11.1 tons per acre. Pasturing other crops materially stimulated the yields of sugar beets as compared with similar rotations not so treated.

The yields of potatoes at all 3 stations were increased by manure, although to a lesser extent than with sugar beets, but manure did not increase potato yields in an alfalfa rotation. Alfalfa influenced potato yields favorably at Scotts Bluff and at Huntley, but consistent results were not obtained at Belle Fourche. In 3 of 4 rotations at Belle Fourche larger potato yields resulted from manuring than occurred after alfalfa, while results at the other stations were less consistent. However, manure evidently sustained potato yields better than alfalfa.

During the first two 7-yr. periods manure did not increase oats yields materially in most instances at the 3 stations. Increases in yields of oats attributable to manure occurred at the 3 locations for the last 7-yr. period in all but one instance. Inclusion of alfalfa in the cropping program stimulated oats yields in every instance at Huntley and Scotts Bluff and in all but one instance at Belle Fourche during the last 7-yr. period. Results for the earlier periods were less consistent.

Irrigated pastures: Rate and frequency of watering tests, E. T. Bremildsen and A. Morgan (*Jour. Dept. Agr. Victoria, 33 (1935), No. 2, pp. 67–74, figs. 6*).—In the irrigated pasture work at Werribee State Research Farm (E. S. R., 71, p. 464) a plat receiving six 4-in. irrigations annually continued to surpass other irrigation treatments in efficiency of water. It was featured by consistent high production of herbage per inch of water supplied through 8 very variable seasons. Late summer and autumn rains increased water efficiency in infrequently irrigated plats. Excessive irrigation decreased efficiency per unit of water. The merits of the sampling technic (E. S. R., 65, p. 821; 71, p. 464), incidence of rainfall and irrigation, and yields and chemical composition of herbage eaten by sheep are also discussed.

Seasonal growth of Victorian pastures: The influence of artificial fertilizers, R. L. Twentyman (*Jour. Dept. Agr. Victoria, 33 (1935), No. 2, pp. 53–62, figs. 5*).—The seasonal responses of different pastures to various fertilizer treatments are described with especial reference to improvement during the summer period.

Viability and germination of seeds and early life history of prairie plants, A. K. Blake (*Ecol. Monog., 5 (1935), No. 4, pp. 405–460, figs. 14*).—The studies with seeds of prairie grasses and forbs made at the University of Nebraska were concerned with seed viability; germination, including test methods, optimum soil moisture content, length of dormant period after planting, and germination of frozen and unfrozen seeds, of seed frozen in moist soil, and of seed in prairie sod and in the prairie; and early life history of prairie plants, including development of roots in relation to tops, seedling development in a garden and the prairie, and winter survival of seedlings.

The Bombay grasses, E. Blatter and C. McCann (*Imp. Council Agr. Res. [India], Sci. Monog. 5 (1935), pp. XXI+324, pls. [191]*).—This monograph, with appropriate keys, describes the subfamilies, tribes, genera, and species of the native, introduced, and cultivated grasses of Bombay Presidency. Illustrations are by R. K. Bhide.

The rhizomes of certain species of grasses, M. W. Evans and J. E. Ely (*Jour. Amer. Soc. Agron., 27 (1935), No. 10, pp. 791–797*).—The rhizomes of Canada bluegrass, quackgrass, redtop, reed canary grass, and Kentucky bluegrass were studied at North Ridgeville, Ohio, by the U. S. D. A. Bureau of Plant Industry, cooperating with the Ohio Experiment Station. Rhizomes and above-ground shoots both were found to develop to a limited extent at all times when weather conditions favored growth. The new shoots of each type develop in greatest numbers at fairly definite seasons which overlap somewhat but do not coincide. In the latitude of northern Ohio new rhizomes appear in greatest numbers on plants of these species chiefly during June, July, August, and early September, while most new above-ground shoots develop from August or September until growth ends and during April and early May.

Much variation occurs in the way in which rhizomes develop. In some species, as Canada bluegrass, the secondary and later rhizomes originate from buds at nodes on older rhizomes at more or less regular intervals, while in other species, as Kentucky bluegrass, a very large proportion of rhizomes originate from buds at the bases of above-ground shoots. The variations in the origin and later development of rhizomes on plants of different species, like variations in manner of branching in their inflorescence, result in different types of rhizome systems. The rate at which a rhizomatous plant spreads depends partly upon external and partly upon inherent conditions. The lengths to which rhizomes grow and the frequency with which new ones develop determine the spread of the area occupied.

The chemical composition of grasses in different growth stages [trans. title], T. B. van Itallie (*Dept. Econ. Zaken [Netherlands], Verslag. Landbouwk. Onderzoek., No. 40 A (1934), pp. 639–693, pl. 1, figs. 2; abs. in Imp. Bur. Plant Genet., Herb. Plants [Aberystwyth], Herb. Abs., 5 (1935), No. 2, p. 91*).—When pure cultures of 14 grasses were grown for 2 yr. on sand, clay, and peat with clay, and analyzed at different growth stages, the variations in composition were in general agreement with those of mixed herbage of natural grassland. Differences in the composition of one grass at different stages were greater than differences of the several species at a given stage. Grasses with a high proportion of leaf before the development of the inflorescence were found to be high in nitrogen and phosphorus in that stage. The highest percentage of nitrogen in the grasses was produced in sand. The analyses of individual grasses collected from natural pastures agreed with those of the grasses grown in pure cultures.

Results for *Agrostis alba*, *Alopecurus pratensis*, *Anthoxanthum odoratum*, *Festuca rubra*, *Holcus lanatus*, *Lolium perenne*, *Poa pratensis*, and *P. trivialis* are reported in detail. *H. lanatus* was observed to be high in ash, potassium, lime, magnesium, and sodium; *F. rubra* low in ash, potassium, lime, and magnesium and high in fiber; *P. trivialis* high in lime and magnesium; *Alopecurus pratensis* high in ash and potassium; *P. pratensis* low in ash and potassium and high in fiber; and *L. perenne* high in sodium.

The dry-matter content of certain grass and clover species, W. E. J. Milton (*Empire Jour. Expt. Agr., 3 (1935), No. 2, pp. 197–202*).—In an investigation into the percentage of dry matter of grass species and red clover when cut as pasture, hay, and aftermath, supplementing a previous study (E. S. R., 71, p. 617), differences among species occurred under each system of cutting. The pasture cuts showed marked seasonal variation, the lowest percentage of dry matter occurring in late May and early June when maximum growth was being made. Pasture-cuts in July, October, and November had the highest dry matter percentages of the series. Comparison of the data with previous findings showed that the dry-matter content of a species grown under grazing conditions is affected by its palatability. The species cut for hay in the heading stage resembled the average of the pasture cuts in percentage of dry matter. The aftermath, consisting of mature herbage, gave higher dry-matter content than the hay and pasture.

A study of moisture changes in standing grain, R. K. Larmour, W. F. Geddes, J. G. Malloch, and A. G. McCalla (*Canad. Jour. Res., 13 (1935), No. 3, Sect. C, pp. 134–159, figs. 9*).—The moisture changes in standing grain (Reward and Marquis wheat and O. A. C. 21 barley) during and after the ripening period were studied at the Universities of Manitoba, Saskatchewan, and Alberta in 1932–33 to obtain information on the problem of combine harvesting. Considerable attention was paid to temperature, humidity, sunshine, rainfall, and wind velocity. Grain was found to be fit for binding 4 to 17 days earlier than for straight combining. There was no evidence that fully ripened grain at moisture contents of 11 to 13 percent could absorb enough moisture at night, due to relative humidity, to exceed 14.4 percent and become tough. The rate of moisture loss in wet mature grain was much greater than the moisture loss in immature grain through the same range.

Seed production studies with legumes in Hawaii, C. P. Wilsie (*Jour. Amer. Soc. Agron., 27 (1935), No. 10, pp. 784–790, fig. 1*).—The seed yields reported for a number of green manure and forage legumes grown at different spacings by the Hawaii Experiment Station indicated favorable possibilities for seed production for most of the legumes tested. Fairly close spacings usually gave better results than wide spacing. With the blue lupine grown at 2,100 ft. elevation the 6-in. hill spacing surpassed wider spacings regardless of the number of plants per hill. The use of 3, 4, or 5 plants per hill, considering each spacing series, gave slightly higher yields than 1 or 2 plants per hill. Yield increases resulted from an increase in the number of plants per acre up to about 87,000 plants. In a seed production study with pigeon pea at low elevations in Honolulu change in spacing within rather wide limits had but little effect on yield. If planted thickly the stems were slender and grew erect with little branching, while with adequate space plants became very bushy with much branching. This adaptability resulted in about the same yields when the stand was varied from 2,000 to 14,000 plants per acre.

[Field crops studies, 1915–34, on Indiana Station experiment fields and farms], A. T. Wiancko et al. (*Indiana Sta., Expt. Farms Rpts., Herbert Davis Forestry Farm, 1923–34, p. 4; Huntington Field, 1919–34, p. 4; Jennings Co. Field, 1921–34, pp. 6–8; Pinney-Purdue Field, 1920–34, pp. 6, 7; Purdue-Vincennes Farm, 1925–34, pp. 7, 8; Sand Field, 1924–34, pp. 5–8; Soils and Crops Farm, 1915–34, pp. 1–7, 9–20, figs. 2*).—Results covering more or less extended periods and continuing previous accounts (E. S. R., 70, p. 321) are reported from variety tests with corn, wheat, oats, barley, rye, and soybeans; crop rotations; effect of certain crops on yields of crops that follow; an experiment on the place in the rotation to apply manure; a comparison of grain v. livestock farming; fertilizer experiments with corn, wheat, alfalfa, and pasture; cultural (including planting) tests with corn and soybeans; variety and stage of cutting tests with alfalfa; and a tile drainage experiment concerned with the effects of the practice and different distances and depths of tiling on yields of several crops in rotation.

[Field crops research at the Puerto Rico College Station], F. A. López Domínguez, P. Richardson Kuntz, F. Chardón, J. Pastor Rodríguez, E. Molinary Salés, T. Bregger, and L. A. Serrano (*Puerto Rico Col. Sta. Rpt. 1934, pp. 32–38, 39, 40–42, 53–57, 64–85, 94–99, 103, 104, 105, 106, 115–120, 121–124, 182–191, 197–201*).—Experimentation with field crops (E. S. R., 72, p. 174) reported on from the station and the Isabela Substation comprised variety, spacing, cultivation, irrigation, fertilizer, trash disposal, green manuring tests, and breeding work, all with sugarcane; fertilizer, spacing, and irrigation trials and breeding work with cotton; fertilizer tests with tobacco and potatoes; and variety trials with potatoes, sweetpotatoes, soybeans, pigeonpeas, cassava, taro, yams, and yautias.

Relation between fallowing and the damping-off of alfalfa seedlings, C. O. Grandfield, C. L. Lefebvre, and W. H. Metzger (*Jour. Amer. Soc. Agron., 27 (1935), No. 10, pp. 800–806, figs. 3*).—In an experiment, 1930–35, at the Kansas Experiment Station in cooperation with the U. S. D. A. Bureau of Plant Industry, alfalfa seed planted on soil fallowed for from 1 to 5 yr. produced seedlings with less vigor and eventually poorer stands than seedlings grown on previously cropped soil. Indications were that reduced stands would not result until after 3 yr. of fallow, yet observations elsewhere in Kansas suggested that the difficulty might result from only 1 or 2 yr. of fallow. The reduced stands were found to be due to death of seedlings resulting from infection by *Pythium* spp. The organism studied was most pathogenic in soils in which the pH varied from 6 to 8.

Winter barley, a new factor in Missouri agriculture, W. C. Etheridge, C. A. Helm, and E. M. Brown (*Missouri Sta. Bul. 353 (1935), pp. 28, figs. 12*).—Information gained in station tests and farm observations since 1921 is given on the merits of winter barley for pasture, grain, as a nurse crop for new seedings of legumes and grasses, to replace corn, and in barley-soybeans and in soybeans-barley-lespedeza rotations. Instructions are also given on the management of winter barley pasture, and winterkilling and barley diseases are discussed briefly with indicated control measures.

Increase of the yield of chickpea seeds in amount and quality through inoculation with nodule bacteria [trans. title], Z. G. Razumovskai͡a (*Trudy Prikl. Bot., Genet., i Selek. (Bul. Appl. Bot., Genet., and Plant Breeding), 3. ser., No. 1 (1933), pp. 13–30, figs. 8*).—Abundant nodule production on roots of chickpea varieties inoculated by bacteria from chickpea nodules and from soil growing chickpeas and none from soil producing abundant nodulation in clover, vetch, and sweetclover indicated strict specificity of the chickpea bacteria. Inoculation resulted in improved growth, yield, and quality.

Cotton varieties for Florida, W. A. Carver (*Florida Sta. Bul. 285* (*1935*), *pp. 22, figs. 2*).—Variety trials with cotton during the period 1925–33, for which results are given, showed Clevewilt and Rhyne Cook to be most profitable and to combine several good characters. Suggestions for the production of cottonseed and a discussion of the effects of soil, rainfall, and date of planting upon lint yields are included.

A device for separating different lengths of fibers from seed cotton, H. C. McNamara and R. T. Stutts (*U. S. Dept. Agr. Circ. 360* (*1935*), *pp. 16, pls. 8, figs. 2*).—The comb type of sorter described with instructions on its operation was developed to array the fibers from one cottonseed at a time. Observations on breakage and slippage of fibers during sorting, loss of fibers in combing, and on the effects of curvature of the seed on fiber measurements are reported on briefly, with a description of a simple device which facilitates measuring individual fiber groups of an array.

Flaxseed: Abstracts and list of references of published reports . . ., compiled by C. L. Phillips and E. G. Boerner (*U. S. Dept. Agr., Bur. Agr. Econ., 1935, rev., pp.* [*3*]+*52, figs. 3*).—This is a revision and enlargement of the bibliography noted previously (E. S. R., 57, p. 130).

Note on the estimation of dry matter in mangels, B. L. Elphick and P. R. McMahon (*Jour. Agr. Sci.* [*England*], *25* (*1935*), *No. 1, pp. 1–5*).—Usual methods of sampling mangel roots by means of horizontal cores in a north-south direction through the largest diameter of the root or one-third way down from the crown appeared to be subject to greater inaccuracies than similar cores taken from two-thirds to three-quarters of the way down.

Potato soil fertility and fertilizer literature for 1934, B. E. Brown (*Amer. Potato Jour., 12* (*1935*), *No. 9, pp. 254–257*).—The review covers 24 titles.

Fertilizers for potatoes.—Second report, B. A. Brown ([*Connecticut*] *Storrs Sta. Bul. 203* (*1935*), *pp. 18*).—The fertilizer experiments with potatoes, 1928–34, reported supplemented earlier work (E. S. R., 44, p. 529).

In an experiment on a potato farm in the Connecticut Valley, designed to measure response to varying quantities of fertilizer of a grade commonly used for potatoes, maximum yields in 4 yr. came from fertilizer supplying about 100 lb. of nitrogen per acre, phosphoric acid 180, and potash 120 lb. In 2 yr. about maximum production occurred where the fertilizer carried nitrogen 75 lb., phosphoric acid 135, and potash 90 lb. Yields were 86 percent of maximum with nitrogen 50 lb., phosphoric acid 90, and potash 60 lb.

In a second experiment at the station on poor, relatively heavy Charlton loam, high in organic matter, under continuous culture for 6 yr., nitrogen 50 lb. and phosphoric acid 80 each averaged 85 percent of a maximum crop, while potash 60 lb. averaged 77 percent. Yield increases were not obtained from over 100 lb. of nitrogen per acre, phosphoric acid 160, and potash 120 lb. Omission of any of the 3 nutrients was much less serious when potatoes alternated with clover and timothy than with continuous potatoes. Rotation plats receiving no nitrogen yielded 95 percent of maximum and nitrogen 50 lb. gave maximum yields. Phosphoric acid 80 lb. and potash 60 lb. averaged, respectively, 92 and 90 percent of a maximum crop. In the soil of these plats about three-fourths of the added phosphorus had been fixed in a relatively insoluble condition. When 80 lb. or more per acre of phosphoric acid was applied annually in the fertilizer the potato yields were not influenced appreciably by varying quantities of easily soluble phosphorus in the soil, provided a minimum of about 30 lb. per acre was present.

In 14 experiments on 4 different soil series, 1932–34, conducted mostly in cooperation with potato farmers, although some of the soils were very acid (pH 4.7) and very low in soluble magnesia and lime no significant effects appeared in the growth and yields of normally fertilized potatoes as a result of adding magnesium sulfate, dolomitic limestone, or hydrated lime. On 2 farms, however, some benefit from lime was indicated by slightly better vine growth and larger yields of tubers. To guard against possible magnesia and lime deficiencies it is recommended that growers have their soils tested, and that fields with a pH below 5 receive from 600 to 1,000 lb. of dolomitic limestone per acre.

The use of lime in potato production in eastern Virginia, J. B. Hester (*Amer. Potato Jour., 12 (1935), No. 9, pp. 235–248*).—The essentials of this contribution from the Virginia Truck Experiment Station have largely been noted from another source (E. S. R., 73, p. 609).

Further experiments on shortening the rest period of potato tubers, F. E. Denny and L. P. Miller (*Contrib. Boyce Thompson Inst., 7 (1935), No. 2, pp. 157–181, figs. 2*).—Further studies (E. S. R., 59, p. 828) on hastening the sprouting of dormant tubers involved the Bliss Triumph and Irish Cobbler potato varieties. When tubers cut for planting and soaked 1 hr. in 1 percent sodium thiocyanate solution were planted in soil flats placed at room temperatures, 29°, and 35° C., favorable results were obtained at all temperatures. Dormant tubers were forced into prompt germination, nondormant tubers were not delayed materially in sprouting, and decay of seed pieces did not follow this treatment. A 0.5 percent solution under these conditions gave similar results except for a somewhat less favorable effect upon germination of dormant potatoes. A 2 percent solution hastened germination but caused rotting of seed pieces in 7 of 24 tests.

At intervals of 7, 14, and 28 days after harvest tubers were stored at 35° for 10, 18, and 30 days, at the end of which periods some lots were planted untreated and other lots after treatment with ethylene chlorhydrin and sodium thiocyanate. Treatments with either chemical hastened germination of the tubers stored at 35°, provided that such storage had not been long enough to cause injury.

With whole tubers exposed to ethylene chlorhydrin vapors for 7 days and stored in bags in air for 14 days after treatment, visible sprouting occurred in about 7 to 10 days after treatment ended and well developed sprouts were obtained with treated tubers at the end of storage. When the treated tubers were cut and planted, a high percentage of sprouts appeared above ground about 20 to 30 days afterwards, even when temperature varied considerably during treatment, during storage, and after planting in the soil. This indicated that it may be possible to develop a procedure for the pretreatment of tubers in the North shortly after harvest in late summer or early autumn for distance shipping to localities in the South, where the potatoes are to be planted.

Potato tubers exposed to ethylene chlorhydrin vapor under conditions found to break dormancy took up relatively large amounts of the chemical. Quantities up to 800 mg per 100 g of tissue were recovered from treated nondormant tubers. The chlorhydrin content of tubers after treatment was observed to gradually become less. A certain amount was given off as vapor for the first few days and a larger amount was decomposed in the tissue.

The vapor pressure curves for ethylene chlorhydrin and for its constant boiling mixture from room temperature to the boiling temperature were determined. Details of a method for determining the chlorhydrin content of treated potato tubers by recovering it by distillation and subsequently forming $BaCl_2$ through reaction with $Ba(OH)_2$ are given. Recovery is about 85 percent.

Breaking of rice in milling in relation to the condition of the paddy, G. Stahel (*Trop. Agr.* [*Trinidad*], *12* (*1935*), *No. 10, pp. 255–261, pl. 1, figs. 8*).—Factors which influence the breakage of rice in milling were examined, 1932–34, at the Surinam Agricultural Experiment Station, using the Smith shelling device (E. S. R., 60, p. 636), the Boerner sampler, and the Brown duvel moisture tester. The optimum moisture content for milling was determined to be 10.5 percent or less, a fact of particular importance in varieties like those in the Skrivimankoti group, which are very susceptible to breakage. There is an optimum harvesting period of from 1 to 3 weeks, during which rice should be cut for the best milling sample. Within the limits indicated this optimum period will be shorter as the season is drier. The "sun cracks", due to rise in moisture content and developing when dry paddy is remoistened, always caused much higher breakage in milling. Indications were that to avoid sun cracks paddy to be stored should not be dried below 14 percent. Sun cracks in milled rice are not considered important. In Surinam, grain and straw generally are harvested together with the hand sickle and left on the stubble to dry. It was shown that if this drying period exceeds 2 days the moisture content of the rice falls below 14 percent and high breakage in milling results. This can be avoided by drying in shocks, which permits extension of the drying period in the field from 8 to 10 days with no or little detriment to milling quality.

Safflower, a possible new oil-seed crop for the northern Great Plains and the far Western States, F. Rabak (*U. S. Dept. Agr. Circ. 366* (*1935*), *pp. 15, figs. 4*).—Practical information is given on the characteristics and habits of safflower (*Carthamus tinctorius*); its commercial importance; soil, climatic, and cultural requirements; diseases and insect pests; methods of crushing and extracting the seed; uses of the oil, press cake, and meal; and returns to the grower.

Safflower, indicated as a dry-land and irrigation crop for the northern Great Plains for production of a drying oil, also seemed well adapted to winter dry-land farming in certain sections of the far Western States. Extensive experiments, 1925–33, showed that the crop fits well into northern Great Plains agriculture, requiring no changes in methods or machinery now employed in small grain production. It withstands spring frosts and drought well; suffers less than small grains from wind and hail; does not lodge, shatter, or discolor; is ideal for combining; and has been relatively free from diseases and insect pests. Maximum yields under dry-land farming have been about 40 bu. per acre, under irrigation from 50 to 65, and average yields 10 and 38 bu., respectively. The seed can be crushed or extracted by the usual methods of producing oil from oilseeds, and the oil, found valuable for use in the paint, varnish, and allied industries, is especially useful in white paints and enamels where permanent whiteness is desired. Such paints show satisfactory durability and weather resistance. Feeding tests with the press cake or meal indicated its value as feed for dairy cattle.

An interpretation of results of fertilizer tests on sugar cane, A. Gordon (*Sugar News, 15* (*1934*), *No. 3, pp. 147–153*).—Examination of the cane, sugar, and money returns in a number of well-controlled fertilizer experiments suggested that results should be limited to the immediate test vicinity and interpreted in terms of odds determined as to income rather than high sugar or cane yield. Yield results might better be stated in sugar yields than in cane yields.

Recent investigations on sugar-cane and sugar-cane soils in Trinidad.—I, General effects of ground limestone, P. E. Turner (*Trop. Agr. [Trinidad], 12 (1935), No. 10, pp. 262–268, fig. 1*).—Field experiments on the effects over a period of single dressings of ground limestone on the yield of sugarcane and on sugarcane soils supplemented work noted earlier (E. S. R., 61, p. 511; 64, p. 320; 71, p. 627).

An application of 10 tons per acre of finely-divided limestone (the lime requirement) to a swamp-and-lagoon clay increased the yield of the first crop series of sugarcane by 19.5 tons per acre, which was divided about equally between plant cane, first ratoons, and second ratoons. It paid for the cost of the limestone, and the lime status of the soils also was greatly improved. Dressings of 10, 20 (the lime requirement), and 30 tons of coarser limestone per acre on a red-weathering clay increased the yield of the first crop series an average of 13 tons of cane, but the gain did not pay for the lightest dressing. The coarser limestone gave a large immediate gain in yield of plant cane, but the residual gains for the ratoon crops were small. On a degenerated soil, limestone gave a very small gain in yield of plant cane, a somewhat larger one for the first ratoons, and a still larger gain for the second ratoons, a result which is believed to characterize effects of lime on soils in poor condition and previously never adequately drained and tilled. The data suggested that with weather conditions unfavorable for good growth a low limit is set to the gain to be had from liming, apart from the fineness of the limestone. Far greater quantities of limestone were shown to remain in the soil unused if coarse rather than fine material was applied.

Time of heading and flowering of early, medium, and late timothy plants at different latitudes, M. W. Evans, H. A. Allard, and O. McConkey (*Sci. Agr., 15 (1935), No. 8, pp. 573–579, fig. 1; Fr. abs., p. 579*).—A series of 13 strains of timothy developed by the U. S. Department of Agriculture in cooperation with the Ohio Experiment Station, ranging from very early to very late, was grown at Washington, D. C., at latitude 38°54′ N., North Ridgeville, Ohio, 41°28′, and Ontario Agricultural College at Guelph, 43°33′. Florets of the earliest strain began to bloom at the southern station 24 days sooner than at the northern one, and in selections progressively less early, differences between the time of heading and of blooming at the southern and northern stations gradually decreased. Selections about medium between earliest and latest produced heads and the florets bloomed at nearly the same time at all stations. The season for heading and blooming of the three latest strains progressed from north to south instead of the reverse.

In very early strains heads develop and flowering occurs with days from 10 to 12 hr. long, while strains later under natural conditions required longer days if grown under days artificially made of uniform lengths. At the southern station days in late spring and early summer are not as long as at the stations farther north. For the earliest strains, day lengths at the southern station suffice for head development to begin before temperature becomes high enough for active growth at stations farther north. With very late strains, however, day length apparently was the limiting factor at these latitudes. Since the minimum day length in spring is attained in the northern hemisphere at stations relatively far north sooner than farther south, the season for heading and flowering of these very late strains of timothy progresses in these latitudes from north to south.

Rates of growth and nitrogen assimilation of Havana Seed tobacco, M. F. MORGAN and O. E. STREET (*Jour. Agr. Res.* [*U. S.*], *51* (*1935*), *No. 2, pp. 163–172, figs. 3*).—The rates of growth and of nitrogen intake by Havana Seed tobacco grown on typical Connecticut Valley tobacco soil, i. e., Merrimac sandy loam, were measured for the period 1929–33 in Connecticut [New Haven] Experiment Station experiments. Data also were secured for plant parts, including roots, stalks, leaves, and seed pods. Practical applications of the results are given.

Early growth for the first 30 days after setting was slow but was followed by a rapidly accelerating increase. The crop attained between the thirty-fifth and fifty-fifth day after setting about 50 percent of the dry weight attained at harvest and took from the soil about 60 percent of its total nitrogen requirement. Topping so interrupted normal development that topped plants, even when grown beyond normal harvest to the time of practical seed maturity on untopped plants, failed by more than 1,500 lb. to attain as great a production of dry matter. This difference is attributed primarily to decreased stalk growth and prevention of normal terminal seed-pod production. Increased production of sucker leaves on topped plants did not exceed the additional production of normal leaves on untopped plants.

The nitrogen content of leaves reached a maximum about 40 days after setting, that of the stalk decreased throughout growth, and that of the roots increased slightly for about 30 days, after which it became progressively less. The crop leaves lost nitrogen after topping. At cutting tobacco had taken up from the soil 114 lb. of nitrogen, of which 39.3 percent was in the crop leaves, 21.5 in sucker leaves, 26 in the stalk, and 13.2 percent in the roots.

Classification of wheat varieties grown in the United States, J. A. CLARK and B. B. BAYLES (*U. S. Dept. Agr., Tech. Bul. 459* (*1935*), *pp. 164, pls. 46, figs. 78*).—This classification is a revision of and supersedes Bulletin 1074 (E. S. R., 49, p. 634), which it resembles in scope. It includes 77 new varieties and omits 68 which are no longer deemed important. The distribution and acreages of classes and varieties of wheat in 1929 have been noted earlier (E. S. R., 70, p. 771).

Varietal differences in the absorption of nitrogen, phosphoric acid, and potash by wheat at the same physiological age and under the same environmental conditions [trans. title], L. MAUME and J. DULAC (*Compt. Rend. Acad. Sci.* [*Paris*], *198* (*1934*), *No. 2, pp. 199–202, fig. 1*).—Chemical analysis of an array of wheat varieties cultured under the same conditions showed that the percentages of nitrogen, phosphorus, and potassium of the plants, when in the same state of physiological development, vary among the varieties. A graphical method is given for showing the mineral balance among the varieties when in the same physiological state.—(*Courtesy Biol. Abs.*)

The protein and moisture content of wheat grown in New Mexico, C. W. BOTKIN (*New Mexico Sta. Bul. 230* (*1935*), *pp. 16, figs. 2*).—Protein and moisture determinations were made on varieties of wheat grown, 1928–34, on dry land and under irrigation and on samples obtained in wheat-producing areas. Under irrigation yields of both spring and winter wheats were high and rather uniform. Hard red spring wheats generally were high in protein content, reaching a maximum of 17.1 percent, soft spring varieties were low in protein, and hard red winter wheats usually did not approach high protein. Wheat yields under dry farming varied widely with seasons and the protein content increased when yields were low and vice versa. The protein over the period averaged 13.7 percent, with a maximum yearly average of 15.6 percent for dry-land wheats.

The hard spring wheats produced under irrigation were mostly high in protein and on the Minneapolis market should have commanded an average premium of about 7.5 ct. a bushel during the period. Similarly, most of the hard red winter wheats from the dry-farming area were high in protein and on the Kansas City market for a similar period should have received premiums of from 2 to 17 ct. a bushel. The moisture content of the wheat, both under irrigation and dry farming, averaged about 4.6 percent below the 13.5 percent average of moister climates. This, the author holds, should be made the basis of a second premium.

Investigations of cell sap concentration in wheat [trans. title], A. Mudra (*Ztschr. Zücht., Reihe A, Pflanzenzücht., 20 (1934), No. 1, pp. 62–71, figs. 4*).—This study dealt with the influence of variety, daily variations, growth period, plant organs, and external factors on cell-sap concentration in wheat. Analysis of cell sap may serve to distinguish between the xerophytic and hygrophytic varieties. Varieties with the highest concentration seem most valuable from an agriculture viewpoint.

The response of English and Australian wheats to length of day and temperature, H. C. Forster and A. J. Vasey (*Jour. Dept. Agr. Victoria, 33 (1935), No. 7, pp. 352–364, figs. 8*).—Free Gallipoli, Red Marvel, and Little Joss wheat (Australian spring and English spring and winter varieties, respectively) were planted in 1931–33 at Werribee State Research Farm at 7- to 10-day intervals throughout the year and were subjected to normal daylight and to a 16-hr. day. Observations at different development stages showed that both length of day and temperature were important factors in the development through the rosette and jointing stages. Germination and the ripening of the spikes were controlled by temperature only. In the rosette stage the winter types ceased development after soil temperature rose above about 15° C., but this did not occur in the spring varieties. The relation of the results to production of new hybrids, acclimatization of imported varieties, and to vernalization treatment of seed is discussed.

A comparison of the barge with other methods of harvesting wheat, A. G. McCalla, D. Cameron, and A. T. Sinclair (*Canad. Jour. Res., 13 (1935), No. 2, Sect. C, pp. 67–78*).—Samples of Marquis wheat harvested by the barge method in 1932 in the Edmonton, Alberta, district under almost ideal harvest conditions equaled or surpassed in grade and quality those harvested by the binder, swather, or straight-combine methods. In 1933 under more adverse conditions, including considerable rain during harvest, the barge samples were the poorest in grade and baking quality. Some loss of material was due to molding and sprouting in the barge stacks. Bin storage markedly improved the grade and quality of barge samples. Wheat combined at a moisture content of 14 percent did not heat or gain in moisture content significantly during storage.

Kernel texture as an indicator of quality in hard red spring wheats, O. S. Aamodt and J. H. Torrie (*Canad. Jour. Res., 13 (1935), No. 2, Sect. C., pp. 79–88*).—The gray wooded (podsol) soils at Fallis, Alberta, were found to provide a satisfactory medium for obtaining differentiation in kernel texture in hard red spring wheats. The correlation studies showed that the varieties tested behaved more or less similarly from year to year in kernel texture, protein content, and loaf volume, but not in partial baking score. Kernel texture appeared to be a better measure of partial baking score than protein content, while the latter was the better index of loaf volume. A close relation was determined between the kernel texture of varieties grown at Fallis and both the partial baking score and loaf volume of the same wheats grown at

Edmonton. The wheat-meal fermentation test was of little value in differentiating between the baking quality of hard red spring wheat varieties.

Quality and keeping properties of flour from wheat grown on the black and gray soils of Alberta, O. S. Aamodt and A. G. McCalla (*Canad. Jour. Res., 13 (1935), No. 3, Sect. C, pp. 160–167, fig. 1*).—The weights per bushel and milling yields of hard red spring wheats grown on the black loam at Edmonton, Alberta, were similar to those for the same varieties grown on the gray (wooded podsolic loam) soil at Fallis, whereas the grade, protein content, and baking quality of Edmonton-grown samples were superior. The flour from most of the samples of wheat grown at Edmonton retained its quality for at least 2 yr. after milling but flour from most of the Fallis-grown samples deteriorated so much during 10 mo. storage that it was unfit for breadmaking. Flour from Reward showed less deterioration than that from any other standard variety grown at Fallis and had the best original baking quality. Reward was the only recommended variety considered satisfactory for the gray soil area.

Production annual: A technical review of flour, cereal, and feed milling (*Northwest. Miller, 184 (1935), No. 2, Sect. 2, pp. 10–16, 17, 20–32, 36, 52–57, 62–64, 68–72, 73, 74, 76, 77, figs. 42*).—Technical papers presented in this number include Baking Test as a Method of Measuring Quality in Winter Wheat, by M. J. Blish (pp. 10, 11); The Story of a Grain of Wheat from Ripening to Bin, by C. O. Swanson (pp. 12, 13); The Wheat Meal Time Fermentation Test, by C. O. Swanson and J. H. Parker (pp. 14–16); Mummy Wheat Won't Grow, by C. L. Brooke (p. 16); Flour Storage (p. 17), and Who's Who in the World of Flour Weevils (p. 48), both by C. H. Briggs; A Glossary of Milling Terms and Expressions, by E. S. Miller (pp. 20–22); Simple Lessons in Thermohygrics (pp. 23, 24, 64); The Determination of Moisture in Wheat and Wheat Products, by J. E. Anderson (pp. 25, 28); Factors That Influence the Protein Content of Wheat, by C. O. Swanson (pp. 26–28, 29); Breeding Better Quality Wheats, by J. H. Parker (pp. 30–32); Biscuit and Cracker Flours, by R. M. Bohn (p. 36); The Microscopic Structure of Wheat, by C. H. Briggs (pp. 52–54); The Truth about Vitamins, by J. S. Hughes (pp. 54, 55); The Present Status of Trieur Research, by O. Haltmeier (pp. 55, 56), and The Historical Development of the Trieur, by Von Rechenberg (p. 57), both trans. by C. L. Brooke; The 1935 Black Stem Rust Epidemic, by E. C. Stakman (p. 62); Wheat Must Be Bred for Rust Resistance, by L. E. Melchers (p. 63); Rust Resistance Tests Made in Kansas, by J. H. Parker (pp. 63, 64); Proteins, by L. R. Smith (pp. 68, 69); The Mineral Content of Feeds, by F. E. Corrie (pp. 69, 70); Vitamins A and D in Feeds, by C. L. Barthen (pp. 70, 71); Recent Developments in Mixed Feeds, by C. W. Sievert (pp. 71, 72); Drinking Habits of the Wheat Berry, compiled by T. A. Rozsa (pp. 73, 74); and Bristles and Brushes, by R. L. Gorker (pp. 76, 77).

What is a weed? A. J. Pieters (*Jour. Amer. Soc. Agron., 27 (1935), No. 10, pp. 781–783*).—Consideration of published definitions led the author to suggest that a weed be defined as "a plant that does more harm than good and has a habit of intruding where not wanted."

[California weeds and their control] (*Calif. Dept. Agr. Mo. Bul., 24 (1935), No. 4–6, pp. 191–194, 219, 220, 232, 238–241, 260, pls. 4, fig. 1*).—The characteristics, distribution, and control measures for several weeds are given in articles entitled Wild Morning-Glory (*Convolvulus arvensis* L.) (pp. 192–194); Mexican Whorled or Narrow-Leaf Milkweed (*Asclepias mexicana* Cav.) (pp. 219, 220); Alkali Mallow (*Sida hederacea* (Dougl.) Torr.) (p. 232); and Pignut (*Hoffmannseggia densiflora* Benth.) (p. 260), all by W. S. Ball and W. W. Robbins; Silver-Sheathed Knotweed as a Pest in Southwestern Alfalfa (*Polygonum argyro-*

coleon Steudel), by M. K. Bellue (pp. 238–241); and Knot-Weed or Kelp (*Polygonum muhlenbergii* Wats.) (p. 191).

Crab grass control on lawns, H. B. Sprague (*New Jersey Stas. Circ. 354 (1935), pp. 4, figs. 2*).—Treatments outlined for control of crabgrass in lawns include fertilizing, liming, raking, and reseeding in autumn; fertilizing in early spring; and watering and cutting in summer. Crabgrass and other summer grasses which may be confused with it are described briefly.

The time to cut dandelions, C. D. La Rue (*Science, 82 (1935), No. 2128, p. 350*).—Examination of dandelion heads in five stages of development with germination tests gave indications that until the white of the dandelion pappus begins to extend beyond the green involucre tips, the heads may be cut and allowed to dry on the lawn without any danger of spreading the weed.

A new means of dissemination of nut grass (Cyperus esculentus L.), W. S. Ball and M. K. Bellue (*Calif. Dept. Agr. Mo. Bul., 24 (1935), No. 4–6, pp. 235–237, figs. 3*).—The penetration of growing potato tubers by nutgrass rhizomes and the development of nutlets within the tubers are described as an additional means of spreading the weed.

Plot tests with sodium arsenite and sodium chlorate as soil sterilants in California, A. S. Crafts (*Calif. Dept. Agr. Mo. Bul., 24 (1935), No. 4–6, pp. 247–259, figs. 7*).—Extensive studies on soil sterilization by the California Experiment Station showed arsenic to be effective and practical for controlling weeds in waste areas. Dosages of 2 to 8 lb. per square rod are indicated according to soil type. The durability of a given application will depend upon soil types, rainfall, weed-seed population, disturbances of the top soil, and contamination with unsterilized soil. Sodium chlorate is indicated to be effective against annuals for longer than 1 yr. in heavy alluvial soils where rainfall is light and is valuable against deep-rooted perennials in most soils, but the rate and time of application should be related to soil type and rainfall.

Where dry application is desirable a combination of sodium chlorate and dry arsenic trioxide to be put on in late winter has proved effective. The chlorate is effective against annuals during the following summer. By the second spring enough arsenic trioxide dissolves and is fixed in the soil to be effective, and the arsenic then continues to act as long as any remains in the soil. The mixture is especially valuable on gravel walks and drives, but care should be taken not to poison valuable shrubs and trees with shallow roots beneath these areas. The ratio of chlorate to arsenic depends upon soil type and the weed species encountered.

Decomposition and movement of herbicides in soils, and effects on soil microbiological activity and subsequent crop growth, I, II (*Canad. Jour. Res., 8 (1933), No. 1, pp. 73–100, figs. 10; 13 (1935), No. 2, Sect. C, pp. 101–114*).—Part 1, by W. E. Bowser and J. D. Newton, describes experiments made at the University of Alberta, 1931–32, to determine residual effects of sulfuric acid, copper sulfate, sodium chlorate, barium chlorate, and sodium dichromate, especially with wheat, on 3 typical Alberta soils. Problems of residual effect were not found with the 2 leaf sprays, sulfuric acid and copper sulfate. Sodium chlorate was observed to remain toxic over about 2 yr., depending mainly on the soil organic matter content and the amount of leaching. The distance that chlorate will leach down into the subsoil depends on the amount of rainfall and the character of the soil. As soon as the chlorate leaches out or is reduced the soil returns to normal productiveness. Sodium dichromate decomposed very rapidly in the soil, but it had a depressing effect on nitrification and on the activity of the soil micro-organisms. However, there was practically no residual effect from sodium dichromate on soils of medium to high organic matter content. Indications were that barium chlorate is similar to sodium chlorate in toxicity.

Part 2, by J. D. Newton and A. D. Paul, describes further experiments to determine the effects of copper sulfate, sodium chlorate, and sodium dichromate, together with new trials with ammonium thiocyanate. The plat tests were limited to Edmonton black soil, and 3 typical Alberta soils were used in the laboratory trials. Copper sulfate applied to fallow plats in 1931 did not affect wheat yields thereon significantly in 1932, or yields of wheat, oats, rye, and flax in 1933, and the soil was not appreciably injured, even temporarily. When sodium chlorate was applied to a series of fallow plats in 1930, and to another series in 1931, the effect of the heaviest applications (1,300 lb. per acre) lasted for 3 yr. in one series, but serious injury from such heavy applications did not persist longer than 2 yr. in either series. Sodium dichromate, applied to fallow plats and wheat plats in 1932, reduced wheat yields very much in 1932, but did not reduce crop yields the next year in either series, as it decomposed and lost its toxicity in the soil rather quickly.

Ammonium thiocyanate, applied to fallow and wheat plats in 1932, reduced the wheat yields even more than sodium dichromate in 1932, retarded nitrification, and did not decompose and lose its toxicity completely during the season of application, but even with the heavier applications (650 and 1,300 lb.) the toxic effect disappeared early in the following season. Total and straw yields of crops planted on these plats generally were increased by the lighter applications (160 and 325 lb.) in 1933, but the grain yields generally were reduced by the heavier treatments. The growth of certain annual weeds was stimulated considerably by this nitrogenous weed killer in 1933 and 1934 in the plats receiving the heavier applications. Laboratory experiments showed that the thiocyanate may be leached out of a soil with water, that it decomposes fairly rapidly in soils under favorable conditions of moisture and temperature and more rapidly in fertile soil rich in organic matter than in poorer soil, and that nitrification in soils is depressed for a time by the ammonium thiocyanate.

A summer hay fever plant survey of Manhattan, Kansas, E. Horn (*Kans. Acad. Sci. Trans., 36 (1933), pp. 91–97*).—This contribution from the Kansas State College includes surveys of the area within the city limits in weeds (22 percent), of the occurrence of the 43 grasses, 24 hay fever weeds, and 75 other herbaceous plants found, and of the relative importance of each species as a factor in hay fever prevalence. Lists and blooming dates are included.

HORTICULTURE

[Horticultural studies at the Puerto Rico College Station], F. A. López Domínguez, V. Medina, E. H. Twight, T. Bregger, and L. A. Serrano (*Puerto Rico Col. Sta. Rpt. 1934, pp. 38, 39, 40, 90–93, 108–114, 120, 121, 191–195, 196, 197, 201, 202*).—Brief reports are presented on the results of variety tests with avocados, mangoes, and citrus fruits; propagation tests with citrus; fertilizer requirements of vegetables, such as peppers, tomatoes, cucumbers, and eggplants; varietal trials with watermelons; thrips control experiments on onions; hybridization of sweet and field corns; shipment of sweet corn to the New York market; and cultural, propagation, and pruning experiments with coffee.

Methods which the market gardener might use in breeding vegetables, C. A. Mahoney (*Veg. Growers Assoc. Amer. Ann. Rpt., 1934, pp. 132–138*).—The pollination habits and requirements of different vegetables and methods of selection and breeding essential to improvement are discussed.

"Cat-tails": A new variety of hop, E. S. Salmon (*Jour. Southeast. Agr. Col., Wye, Kent, No. 36 (1935), pp. 41–47, figs. 5*).—A description is presented of a new hop variety derived by natural crossing of the wild American form with the English male hop. The new variety was found highly resistant to mold and mosaic diseases and to possess the strong aroma desired for certain brews.

New York hop industry was not accidental, J. D. Harlan (*Farm Res. [New York State Sta.], 2 (1935), No. 1, pp. 2, 8, fig. 1*).—Brief mention is made of the early history and development of hop growing in New York State, with comments on temperature, rainfall, and soil requirements, all of which are favorably found in certain areas of the State.

Old Dominion spinach proves valuable for fall, winter, and early spring crops in Ohio, F. A. Romshe and H. D. Brown (*Ohio Sta. Bimo. Bul. 176 (1935), pp. 171, 172*).—Because of mosaic-resistant qualities the Old Dominion spinach developed by the Virginia Truck Experiment Station proved a valuable winter variety. Mulching with straw, either fresh or sterilized, resulted in yellowing and stunting, indicative of nitrogen starvation. Finding that an application a few days after mulch removal of 400 lb. per acre of nitrate of soda did not fully restore color, determinations were made of the soil nitrates, which revealed 40, 33, and 12 p. p. m. in the unmulched, sterilized straw, and fresh straw plats, respectively. The yields on April 25 were 9,280, 4,960, and 3,840 lb. per acre, respectively. Old Dominion was slower than Virginia Savoy in forming seed stalks. Bloomsdale Savoy planted under similar conditions was entirely winter-killed.

Storage of winter squash, W. D. Enzie (*Farm Res. [New York State Sta.], 2 (1935), No. 1, p. 9*).—In discussing the requirements for successful storage the author states that observations on some 30 varieties of winter squash showed the great majority not desirable for long storage. Warted Hubbard, Blue Hubbard, Improved Green Hubbard, Warren Turban, Bay State, Marblehead, and Banana retained good edible quality until March.

Mineral deficiency symptoms in tomatoes and cucumbers, I. C. Hoffman (*Veg. Growers Assoc. Amer. Ann. Rpt., 1934, pp. 160–171*).—Descriptions are presented of the foliar, root, and fruit symptoms resulting from deficiencies in nitrogen, phosphorus, potassium, calcium, magnesium, and manganese.

Wrapping tomatoes, J. D. Caruso and R. B. Harvey (*Food Indus., 7 (1935), No. 8, pp. 375, 376, 416, figs. 2*).—Comparisons by the Minnesota Experiment Station of three wrapping materials, namely, (1) ordinary plain paper, (2) moisture-proof transparent cellulose, and (3) plain nonmoisture-proof transparent cellulose, for the protection of healthy disinfected tomatoes showed the least weight loss in treatment 2, but the accumulation of moisture within the wrapper is said to be a serious hazard in the case of unsterilized tomatoes. Ripened without ethylene in a room held at 24° C. (75° F.), the moisture-proof wrappers hastened coloring, apparently due to the retention of carbon dioxide and other gases. There was little difference between ordinary paper and the unwrapped controls. Subjected to an atmosphere of 1 part of ethylene to 1,000 parts of air, there was observed no marked difference in the relative rates of ripening in the three wrappers. Where sound tomatoes were subjected to air passed over rotted tomatoes the moisture-proof paper practically prevented the absorption of objectionable odors. Since unwrapped fruits also had a negligible odor, it is assumed that the unfavorable odor was accumulated by absorption by the wrapper and in turn transmission to the fruit. At a constant temperature of 5° sterilized tomatoes kept better in the moisture-proof wrapper. In studies with inoculated fruits, wrapping, particularly with moisture-proof paper, retarded the spread of disease to healthy fruits.

How much water do trees need? A. J. Olney (*Ky. State Hort. Soc. Trans., 1934, pp. 61–66*).—This is a discussion of the relationship between soil water and water requirements of tree fruits.

Fruit-tree rootstocks: Methods of vegetative propagation, C. E. Woodhead (*New Zeal. Jour. Agr., 50 (1935), No. 2, pp. 92–95, figs. 4*).—Stooling was successfully employed in the vegetative propagation of Malling stocks I, IX, XII, XIII, XV, and XVI. Layering was successful in the case of selected seedlings of wild pear (*Pyrus communis*), various types of mazzard cherry, several plums, and Cox Orange, Delicious, Gravenstein, Jonathan, and Sturmer apples.

Raw linseed oil and seal oil for controlling irregular blossoming and foliation in fruit trees, C. W. Mally (*Union So. Africa Dept. Agr. Bul. 125 (1934), pp. 23, figs. 12*).—At the University of Stellenbosch, Union of South Africa, it was observed that fruit trees sprayed with a mixture of raw linseed oil and water for the control of woolly aphis blossomed in a strong, uniform manner and developed vigorous leaf growth as compared with irregular blooming and growth in control trees. In some instances the crops were definitely increased by the oil treatments. Five yr. of spraying failed to produce any detrimental effects except where the water failed to mix with the oil or agitation in the tank was not complete.

Results of incorporating a heavy application of superphosphate deeply into an orchard soil, G. F. Potter (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 70–72, fig. 1; also New Hampshire Sta. Sci. Contrib. [46 (1934)], pp. 70–72, fig. 1*).—An analysis of 6 years' records, during which two heavy crops were produced, indicated at the New Hampshire Experiment Station that with seven replications a single heavy application of phosphorus to a soil originally containing only about 1,000 lb. of P_2O_5 per acre 8 in. of soil increased yields of mature Baldwin trees by an average of 34 lb. per tree per year as compared with controls. The odds by Fisher's modification of Student's method were 19:1. Since all the trees in the experiment received 10 lb. of nitrate of soda or its equivalent each year, the comparison was essentially that of nitrogen plus phosphorus with nitrogen alone. From an economic standpoint the increased yields from phosphorus were not sufficient to justify its use.

Spray-residue removal from apples and other fruits, M. H. Haller, E. Smith, and A. L. Ryall (*U. S. Dept. Agr., Farmers' Bul. 1752 (1935), pp. II+26, figs. 6*).—This publication, a revision of and superseding an earlier paper (E. S. R., 66, p. 231), presents recent developments in spray residue removal, particularly with reference to washing media and equipment for fruits sprayed with different materials. Among fruits considered in addition to the apple are pears, peaches, cherries, grapes, and currants. Peaches cannot be treated with hydrochloric acid solutions because of the resulting severe acid injury.

Getting away from lead residue, R. L. Webster (*Better Fruit, 30 (1935), No. 4, pp. 5, 6, fig. 1*).—Trials by the Washington Experiment Station of calcium arsenate as a substitute for lead arsenate in the control of codling moth in the Wenatchee district gave encouraging results, although it was apparent that it is more difficult to maintain adequate protection in the late season with the calcium arsenate because of its poorer adhesion. Analyses of arsenical deposits before and after each spray aided greatly in interpreting results. Calcium arsenate when applied with proper safeners, such as zinc sulfate or aluminum sulfate, was found of equivalent value to straight lead arsenate. The most promising combination to date is calcium arsenate 4 lb., hydrated lime 2 lb., zinc sulfate 1 lb., and water 100 gal.

Apple orcharding: Winter injuries, grass endurance, irrigation and nitrate, twenty-sixth to thirtieth year of a 14-variety orchard, M. B. Cummings, E. W. Jenkins, and R. G. Dunning (*Vermont Sta. Bul. 395 (1935), pp. 67, pls. 4, figs. 10*).—In this further report (E. S. R., 63, p. 834) on the station variety orchard, there is discussed winter injury resulting from the severe season of 1933–34, with notes on the nature of the injury and varietal response. Trees which fruited heavily in 1933 suffered more damage than those which fruited lightly that year. Baldwin, Northern Spy, Ben Davis, Pumpkin Sweet, Rhode Island Greening, Mann, Fallawater, and Astrachan were badly injured, McIntosh, Arctic, and Delicious somewhat injured, and Cortland, Haralson, Joyce, Fameuse, Lobo, Ranier, Starking, Wealthy, Kendall, and Macoun only slightly harmed. Winter tolerance depended somewhat on the care given and the health of the tree but is conceded largely a matter of varietal resistance. Observations on the grass cover in the orchard showed that orchard grass is better adapted than Kentucky bluegrass or couch grass as a ground cover. Irrigation sufficient to double or triple the natural rainfall increased twig and leaf growth and number and size of fruits, but decreased the keeping quality. Nitrate of soda in large applications had much the same effects as the additional water. During the 5 yr. from 1930 to 1934 Fameuse led among 14 varieties in the total number of fruits, as it had over the entire 30-yr. period. Baldwin and Wealthy required particular attention in fruit thinning. The highest percentage of grade A apples was produced by Yellow Bellflower.

Effect of crop and treatment on winter injury to Baldwins, M. A. Tingley and G. F. Potter (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 234–238, figs. 4; also New Hampshire Sta. [Sci. Contrib. 47 (1934)], pp. 234–238, figs. 4*).—Observations following a winter minimum of —31° F., which severely injured or killed all Baldwin trees of bearing age, indicated that soil and spraying treatments may exert a considerable influence on the capacity or lack of capacity of apple trees to withstand low temperatures. Trees sprayed with mild sulfur plus calcium arsenate showed as little as 22 percent injury the following October as compared with 60 percent for the remainder of the orchard. The authors believe that the heavier sprays may have reduced photosynthetic activity and thus interfered with the production of certain products contributing to resistance. In respect to cultural treatments, trees in sod with manure mulch applied at the rate of 400 lb. per tree suffered 93 percent injury as compared with a minimum of 33 percent in the sod group fertilized with 10 lb. of sodium nitrate per tree. Yield records of the preceding crop showed some differences due to size of crop but not enough to account for the differential injury. The possibility that the manure delayed maturity of the wood is discussed.

Photosynthesis in apple leaves during late fall and its significance in annual bearing, A. J. Heinicke (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 77–80*).—Using as plant material vigorous 6-year-old McIntosh trees growing in grass sod, it was found in these experiments in the Cornell University orchard that the rate of photosynthesis of the foliage which is beginning to lose its green color in autumn may be accelerated by applications of quickly available nitrogen. The dark green leaves resulting from nitrogen treatments showed a very high average rate of carbon dioxide assimilation as late as the third week of October, at which time there was a rapid loss of green coloring in all the trees. The extra reserves of carbohydrates resulting from late activity are believed important in the development of a large leaf surface per spur the succeeding spring, which in turn is an important factor in bringing about regular bearing in many varieties of apples. The much greater root growth during autumn in trees retaining their foliage in a dark green state is also important the succeeding spring in promoting a large early leaf surface. The exposure of branches to 0° F. beginning November 10, 1934, indicated that early winter hardiness may be increased by the late application of nitrogen. It is emphasized, however, that timing of the application is highly important and that too early treatments would simply tend to continue shoot growth and reduce cold resistance.

Photosynthetic activity and internal structure of apple leaves are correlated, W. F. Pickett (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 81–85*).—In this study, conducted by the Kansas Experiment Station, orchard-grown Livland apple leaf mesophyll was found to have larger intercellular spaces than did leaves of the same variety grown in a greenhouse where day temperatures ranged from 65° to 75° F. and night temperatures were seldom below 45°. The orchard-grown Livland trees made a net gain of 5.93 g of dry matter per square meter of leaf area per day as compared with 3.48 g for greenhouse trees; with Delicious the figures were 4.68 and 1.88 g, respectively. Apparently the more open mesophyll of the orchard-grown leaves was a factor in their more active carbon assimilation. The prevailing weather in the case of the orchard trees was hot and dry, and observations on stomatal behavior on July 18 showed none open after 6 a. m. Repeated tests with the modified Sachs method showed a fairly close correlation between night temperatures and the amount of dry matter lost by leaves between 2:30 p. m. and 6 a. m. Comparisons of the photosynthetic activity of Delicious leaves of trees with and without fruit showed greater dry weight accumulation during the day in the fruiting trees.

The intensity of light striking leaves of apple trees at different times of day, E. P. Christopher (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 86–92, figs. 4*).—With the aid of a Weston illuminometer light intensity readings were taken by the Rhode Island Experiment Station in late autumn on foliage of a 25-year-old McIntosh apple tree, the leaves being in different locations and at different angles with reference to the horizontal. It was found that both the position on the tree and the angle of the leaf's surface play important roles. The total foot-candle hours were greatest on the south side in leaves pointing out at an angle of 60° below the horizontal. The minimum total foot-candles was recorded on the north exposure in the case of leaves pointing back into the tree at an angle of 30° above the horizontal. No leaf on the north side received more than 4 percent of the total light for the day, and even in midsummer the chance for leaves on the north side to receive very high intensities is believed slight; in fact the author suggests that at the late date of November 3 light was a limiting factor most of the day for all the leaves on the tree except those on the southern exposure.

Some responses of Yellow Transparent apple trees in Delaware to various nitrogen treatments, F. S. Lagassé (*Delaware Sta. Bul. 195 (1935), pp. 42, figs. 6*).—Working in an orchard of 20-year-old Yellow Transparent trees in vigorous condition and previously well cared for with respect to spraying, nitrating, and cover crops, the author found that applications of nitrogen over a 5-yr. period increased the circumference and terminal growth but had no significant effect on total yields or on the bearing habit of the trees. In fact, in certain cases the biennial fruiting habit was apparently accentuated. In six of eight plats nitrogen increased the percentage of the first pick, but the differences were not significant. No significant increases were recorded in the number of bushels of fruit harvested in either the first pick or total harvest from the nitrogen treatments. With one exception nitrogen had no significant effect on firmness or keeping quality of apples held at prevailing temperatures after picking. However, significant softening was noted in the case of fruits from four of the nitrogen-treated plats when the apples were placed in cold storage. Nitrogen did not greatly affect the percentage of moisture in the fruit or seeds but did increase the percentage of nitrogen in the flesh though not in the seeds.

Response to nitrogen fertilizers applied in different areas under Rome apple trees, P. C. Marth (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 73–75*).—In a fertilizer placement study conducted by the University of Maryland, 10 lb. of nitrate of soda was applied in eight different positions with reference to the trunks of 25-year-old Rome Beauty apple trees located at Hancock, Md. Measurable responses were obtained from all treatments up to the maximum distance (15 ft.), but the results were least when the fertilizers were concentrated in the zones near the trunk, suggesting the advisability of scattering nitrate over a rather wide area beneath the tree. The best fruiting response was secured when the fertilizer was distributed in a 12- to 15-ft. zone, but no evidence of tree injury was observed with any of the treatments. Some observations on roots of nearby Stayman Winesap trees showed a larger proportion of fibrous roots in the upper foot at the greater distances from the trunk.

Additional studies on the effect of commercial forms of nitrogenous fertilizers as applied to apple trees, R. S. Marsh (*Amer. Soc. Hort. Sci. Proc., 31 (1934), p. 76*).—In this brief abstract of the results of a study conducted by the Illinois Experiment Station, it is stated that analyses of young apple trees which had been fertilized with ammonium sulfate showed an earlier mobilization of nitrogen in trees treated the preceding autumn than in spring-treated trees. This was indicated by a greater amount of total nitrogen in the preceding season's growth of the fall-fertilized trees, whereas the total nitrogen of the root system was higher in the case of the spring-treated trees. Calcium cyanamide produced no effects different from the control trees except that soil nitrates were higher in September and October in the cyanamide plats than in the control plats or those receiving other forms of commercial nitrogen.

The effect of spraying apple leaves with certain less used materials upon their carbon dioxide intake, E. L. Overholser and F. L. Overley (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 93–96*).—Observations with the Heinicke and Hoffman apparatus (E. S. R., 68, p. 744) on leaves of 1-year-old Jonathan apple trees growing in pots in the greenhouse of the Washington Experiment Station and sprayed (1) with calcium arsenate 3 lb., zinc sulfate 1 lb., and calcium hydrate 2 lb. with water to make 100 gal., and (2) calcium arsenate 3 lb. and 0.5 gal. of mineral oil with water to make 100 gal. showed that both sprays when applied thrice at 14-day intervals did not affect adversely carbon dioxide assimilation. In fact, the leaves sprayed with the first mixture seemed slightly more efficient than did control leaves.

The effects of certain fertilizers upon the carbon dioxide intake of mature Jonathan apple leaves, L. E. Tompkins (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 97–100, fig. 1*).—Records taken by the Washington Experiment Station on the carbon dioxide intake of comparable leaves on 25-year-old Jonathan trees located on different plats of a fertilizer experiment operated continuously since 1927 showed that the nitrogen and the nitrogen-phosphorus trees were practically equal in carbon dioxide intake, while those of the phosphorus plats were much less efficient. Since earlier studies on the same plats by Larson (E. S. R., 70, p. 335) had shown a much higher percentage of phosphorus in the leaves of the phosphorus treated plats, the author suggests that phosphorus may have a depressing effect on carbon dioxide intake when it is used alone. Night readings showed that leaves which were absorbing only a small amount of carbon dioxide in the day were giving off a relatively large amount at night, and vice versa.

Fish oil sprays as affecting the carbon dioxide intake by Jonathan apple leaves, G. W. Young (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 101–

103).—At the Washington Experiment Station it was found that leaves of 1-year-old Jonathan apple trees growing in pots in the greenhouse when sprayed on both surfaces with herring fish oil 1 qt. and arsenate of lead 3 lb. and water to make 100 gal. were less effective than control leaves on the same tree as to carbon dioxide absorption. In the case of a single application there was an apparent recovery of carbon dioxide absorbing power, but this was not observed after a second or third spraying. There was, however, no visible injury following three sprayings.

The effects of several summer oils on the carbon dioxide assimilation by apple leaves, M. B. Hoffman (*Amer. Soc. Hort. Sci. Proc., 31* (*1934*), *pp. 104–106*).—Studies at Cornell University of the effects of three commercial brands of summer spraying oils on the carbon dioxide assimilation by the leaves of vigorous 7-year-old Northern Spy trees growing in alfalfa sod showed two of the brands to reduce the amount of carbon dioxide absorbed and the third to have very little, if any, influence; in fact, in one comparison the third oil actually showed a slight beneficial effect over the check. None of the three oils caused any visible destruction of leaf tissues.

A physiological study of cracking in Stayman Winesap apples, L. Verner (*Jour. Agr. Res.* [*U. S.*], *51* (*1935*), *No. 3, pp. 191–222, figs. 5*).—In this joint contribution from the West Virginia Experiment Station and Johns Hopkins University, it is pointed out that fluctuations in soil moisture content greater and more rapid than those ordinarily occurring in the orchard showed no relationship to the occurrence or severity of cracking. Mercury manometers attached to the cut tips of branches showed vascular suction at all times, and attempts to produce cracking by forcing water under 5 to 10 lb. of excessive pressure per square inch into the cut ends of detached fruit-bearing branches failed. Although some cracking occurred in fruits on branches protected from rain, cracking was much more severe when apples still attached to the tree were submerged in water. Detached apples with calyxes and stems sealed were caused to crack by submergence in water for several days, suggesting the possibility that long-continued rains may aggravate cracking. The occurrence and severity of cracking were not found related in any way to air temperature fluctuations. Noting that not all the apples on a branch cracked under weather conditions favorable to cracking, studies were made of the individual fruits, and it was found that in most cases injury was initiated in regions showing some form of visible abnormality, such as russeting, scab lesions, sun scald, or unusually high color. The immediate cause of cracking apparently lies in a rapid enlargement of tissues lying beneath areas of excessively stretched skin. Cracking was generally more pronounced on branches with sparse foliage. In the case of attached apples suspended under water, cracking generally occurred most severely in fruits that were growing most rapidly.

Freezing point determinations showed tissues below russeted areas to have higher osmotic values than similar tissues from unmodified areas. The combination of mechanical weakness of the skin and high tissue pressure in the underlying cortex evidently provided a most favorable environment for cracking. Dye solutions supplied the cut ends of attached branches bearing fruits were found most concentrated in the peripheral regions characterized by russeting, scab lesions, or more or less suberized cracks. This would indicate that such regions received water more freely than other parts of the fruit.

A new method of fruit and vegetable preservation: The metabolism of apples, M. Copisarow (*Jour. Soc. Chem. Indus., Chem. and Indus., 54* (*1935*), *No. 13, p. 283*).—The keeping properties of ripe apples, pears, citrus, pineapples, and bananas were considerably increased by spraying with maleic acid, the medium of which was adapted to the flavor of the particular fruit. Aqueous solutions of maleic or fumaric acid were not found effective. It is deemed likely that maleic acid is produced during the metabolism of apples, and that degradation of maleic acid to ethylene occurs under the influence of modified enzymic activity.

Apple storage, G. F. POTTER (*Amer. Fruit Grower, 55* (*1935*), *No. 9, pp. 5, 6, 12, 14, figs. 3*).—In this general discussion the author points out that at the New Hampshire Experiment Station findings have shown that whereas 30° F. lengthened the keeping life of McIntosh apples, the ultimate quality was not equal to that of fruit held at 32°. In from 30 to 35 days a temperature of 32° killed all railroad worms in apples. The holding of McIntosh apples for from 4 to 5 days at ordinary outdoor temperatures prevailing at harvest markedly reduced internal break-down in stored fruit. Scab lesions increased in size in storage at 32°, indicating the need of careful spraying and selection of fruits. Picking maturity was highly important; for example, Cortland when picked early scalded badly even if wrapped in oiled paper, and if picked late was especially susceptible to break-down in the outer cortical area. Fertilizer treatment had no material effect on keeping quality of apples.

Experiments on the canning of apple juice, D. A. TUCKER, G. L. MARSH, and W. V. CRUESS (*Fruit Prod. Jour. and Amer. Vinegar Indus., 15* (*1935*), *No. 1, pp. 7, 8*).—At the California Experiment Station, Gravenstein apple juice treated in various ways, such as heating to 140°, 160°, 165°, and 180° F. with or without the addition of such materials as hydrogen peroxide to intensify oxidation or sodium hydroxide to reduce acidity, was stored in 8-oz. tins at temperatures of from 80° to 85°. After 8 mo., corrosion was found in all lots, ranging in intensity from moderate to severe. At the end of 2 yr. only one lot showed 100 percent of the cans in good condition, with 0 percent in several lots. In a later trial apple juice placed in high vacuum at room temperature for 10 min. to remove the dissolved oxygen and then heated to 120° and poured hot into coke plate tin cans, which, after sealing, were pasteurized at 140° for 40 min. or 180° for 20 min., showed no swollen or perforated cans after 15 months' storage at from 80° to 85°. Even when yeast and mold spores were included 130° pasteurization for 60 min. prevented fermentation. Based on the results, a procedure is outlined for handling apple juice.

Pears: Their pollination, the relative order of flowering of varieties, their cross fertilization, and the insect visitors to the blossoms, C. H. HOOPER (*Jour. Southeast. Agr. Col., Wye, Kent, No. 36* (*1935*), *pp. 111–118*).—Of 77 varieties of pear under observation, 38 matured some fruits with their own pollen, and it is conjectured that even the most fruitful variety would yield four times as much fruit if cross pollinated. A table is presented showing the time of flowering of 46 varieties, and effective varietal combinations are suggested based on the author's observations and the results of other English pollination work. Of insects recorded as visitors to pear blossoms, the honeybee was by far the most abundant.

Behavior of three picks of Elberta peaches in relation to temperature of storage, W. H. SMITH and WILLISON (*Canad. Hort. and Home Mag., 58* (*1935*), *No. 9, p. 209*).—Observations on Elberta peaches picked at St. Catharines, Ont., on September 2, 6, and 11, showed the advantage of deferred harvesting as related to maximum quality shown in color and flavor. Of three storage temperatures employed, namely, 32°, 37°, and 45° F., the first was most effective in holding peaches, and fruits harvested in a firm ripe stage kept satisfactorily for from 10 to 14 days. Even at the 45° temperature the September 2 lot failed to develop satisfactory dessert quality. More rapid decay of fruits removed from storage than those ripened without storing is believed related to the condensation of water vapor on the cold fruits.

A survey of the behavior of cherry trees in the Hudson River Valley, with particular reference to losses from winter killing and other causes, L. C. Anderson (*New York State Sta. Bul. 653* (*1935*), *pp. 23, figs. 6*).—Heavy losses in both sour and sweet cherries following the severe winter of 1933–34 led to a careful study which showed that of various factors concerned soil type, drainage, vigor of tree, and nature of the rootstock were of major importance. Cherries, both sweet and sour, on mazzard roots in light sandy soils, particularly young trees with root systems not well established, suffered severe winter injury to their roots. Older trees with roots more deeply imbedded survived better, although many suffered injury to their surface roots. Vigorous trees on mazzard roots growing in the stronger, well-drained soils suffered very little injury. Little root damage was observed on mahaleb-rooted trees, but since over a period of years the mahaleb-rooted trees have suffered far more from other causes than winter injury, notably summer droughts, the author concludes that for the Hudson River Valley mazzard roots are more desirable for most soils, despite an occasional severe winter. It is urged that the organic matter content of cherry orchard soils be increased by cover crops and manures as a means of decreasing winter injury.

Good pollination means more grapes, F. E. Gladwin (*Farm Res.* [*New York State Sta.*], *2* (*1935*), *No. 1, pp. 5, 10*).—During a period of high winds and considerable rain, sticky screens placed at various distances from a late-blooming male grapevine collected pollen 16 ft. away but none at 24 ft. In another year with gentle to fresh breezes anthers were carried 8 and 16 ft. Concord, Butler, and Lindley varieties set more berries and formed more compact clusters when hand-pollinated, indicating the desirability of providing cross-pollination by planting compatible varieties within a distance of 16 ft.

Passion fruit products, H. D. Poore (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, *14* (*1935*), *No. 9, pp. 264–268, 285, figs. 3*).—This paper discusses the preparation of different products, such as carbonated drinks, jellies and sirups, the composition of the juice, seeds, and shells, and methods employed in removing the pulp and juice. Total sugars in one sample of juice were 11.32 percent, of which 7.69 percent was invert sugar and 3.63 percent was sucrose. Approximately 70 acres of passion fruit vines are said to be now growing in California.

A monoecious date palm, W. E. Bryan (*Jour. Heredity*, *26* (*1935*), *No. 4, p. 146, fig. 1*).—A brief record is presented of the occurrence of female flower clusters on an ostensibly male palm growing in the University of Arizona Date Garden near Tempe.

Grapefruit investigations in Trinidad, F. Hardy and G. Rodriguez (*Trop. Agr.* [*Trinidad*], *12* (*1935*), *No. 8, pp. 205–215*).—In this summary of results obtained by the Imperial College of Tropical Agriculture since January 1934, it is pointed out that in the acidic soils of Trinidad calcium appears to be a particular need for grapefruit and citrus. Available phosphorus was very deficient, with available potash variable but generally medium. Nitrogen was usually abundant. Potassium, together with nitrogen in appropriate amounts, produced the most satisfactory growth in young grapefruit trees on limed soil. Close reciprocal relationships were observed in chemical analyses of leaves in the case of potash and lime and potash and nitrogen. Analyses of the fruit indicated a relatively high proportion of juice and pulp and a very high sugar-acid ratio as compared with published analyses of the Florida, Texas, and Puerto Rico fruit. Grapefruits grown on limed soil had a higher sugar-acid ratio than those from acid soil. Choice fruit appeared to have slightly more sugar and acid and a higher sugar-acid ratio than did cull fruit.

Bud differentiation in smudged mango trees, P. E. Alcala and A. San Pedro (*Philippine Agr., 24 (1935), No. 1, pp. 27–40, pls. 4*).—Descriptions based on macroscopic and microscopic examinations are presented of the dormant and smudged shoot buds of mango trees of four varieties. Distinctive changes were noted in the shape of the sheaths of shoot buds which were forming leaves only, and these buds usually exhibited rapid elongation. In the flower bud the outer scales were like those of the leaf bud, but the inner scales never showed distinct laminar formation. Mixed leaf and flower buds were distinguished from leaf buds by a peculiar arrangement of the tips of their leaf primordia. Microscopically the different types could be distinguished after from 6 to 8 days of smudging. The flowering bud exhibited activity not only in its apical meristem but also in the axillary or lateral meristems.

Progress report on Kellogg nut cultural project of the Michigan State College, J. A. Neilson (*North. Nut Growers Assoc. Proc., 24 (1933), pp. 28–33*).—Notes are presented on the results of searches for superior nut trees, topworking tests, and on accessions to the trial plantings on the Kellogg Demonstration Farm near Augusta, Mich.

Notes on the filbert orchard at Geneva, G. L. Slate (*North. Nut Growers Assoc. Proc., 24 (1933), pp. 34–37*).—Included in the discussion are notes on winter injury, productivity, and characteristics of varieties, and on breeding activities.

The relation of geographic strain to hardiness in the English walnut, J. A. Neilson (*Michigan Sta. Quart. Bul., 18 (1935), No. 1, pp. 15–22*).—Stating that the unusually warm autumn and abundant rainfall preceding the very severe winter of 1933–34 afforded a severe test for English walnuts, the author presents data on the behavior of a large number of varieties scattered over the southern half of the Lower Peninsula in Michigan and southwestern Ontario. The consistent variation in resistance observed suggested a classification of English walnuts into definite groups according to their probable origin. The types of injury are described, and measures which favor survival, such as the use of hardier types, the moderate application of nitrogen, and the early cessation of tillage, are discussed.

Annuals which reseed in Michigan, C. E. Wildon (*Michigan Sta. Quart. Bul., 18 (1935), No. 1, pp. 12–14*).—Following a brief discussion, lists are presented of a large number of annual flowers which were able or unable to survive the winter of 1933–34 as naturally sown seed.

Fall planting best for all peonies, L. M. van Alstyne (*Farm Res. [New York State Sta.], 2 (1935), No. 1, pp. 5, 6, figs. 2*).—Cultural suggestions are given.

Ornamental shrubs and trees: Their selection and pruning, A. J. Sweet, edited by W. P. Wright (*London: J. M. Dent & Sons, 1935, pp. XIII+64, pl. 1, figs. 33*).—This is a practical handbook prepared from the English viewpoint. It contains a foreword by E. Beckett.

Winter hardiness of shrubs at Grand Rapids, Michigan; winter of 1933–1934, J. E. Wilde (*Michigan Sta. Quart. Bul., 18 (1935), No. 1, pp. 24–28*).—Largely in tabular form, data are presented upon the behavior of a large number of evergreen and broad-leaved shrubs following the disastrously cold winter of 1933–34.

The desert milkweed (Asclepias subulata) as a possible source of rubber, R. E. Beckett and R. S. Stitt (*U. S. Dept. Agr., Tech. Bul. 472 (1935), pp. 20, figs. 5*).—Found most promising among 64 southwestern species, the desert milkweed was brought under cultivation at Bard, Calif., for intensive study of its possibilities as a source of rubber. Spacing experiments showed that close planting increased the acre yields of rubber. Unthinned 2-year-old plants in rows 1 ft. apart yielded 212 lb. per acre as compared with 71 lb. for plants spaced 3 ft. apart in 4-ft. rows. An examination of large numbers of plants collected in their native habitats showed a range in rubber content of from 0.5 to 6 percent, with an average of 2.86 percent. Plants grown at Bard from seed of high-percentage plants attained a maximum of 5 percent rubber at 3 and 4 yr. The rubber content reached a maximum in both wild and cultivated plants during the dormant season. After 2 yr. of storage, plant material retained its rubber content, whereas similar material exposed to the weather lost practically all its rubber in 90 days. Attempts to develop high-yielding strains of desert milkweed by plant selection are said to be unpromising because of self-fertility and difficulties in propagating cuttings, crown division, or budding. Three insects, an aphid, a hemipteron, and the larva of the milkweed butterfly, were found injurious, but only to a moderate degree.

FORESTRY

Applied silviculture in the United States, R. H. WESTVELD (*Ann Arbor, Mich.: Edwards Bros., 1935, pp. VI+415, figs. 87*).—In connection with a general discussion of forest types and silvicultural practice in the various important forestry regions of the United States, the basic ecological and economic factors and the climate, physiography, and past practices are considered.

Ohio Forest News [September 1935] (*Ohio Forest News [Ohio Sta.], No. 26 (1935), pp. 12, figs. 8*).—This pamphlet contains notes on road construction and other improvements in the State forests and on forest taxation and extension activities.

Propagation of trees and shrubs for game food, P. W. ROBBINS (*Michigan Sta. Quart. Bul., 18 (1935), No. 1, pp. 35–37*).—Observations on July 1, 1931, upon 8-in. cuttings of the preceding year's growth of serviceberry, dogwood, and basswood, set out May 11, showed 82 percent of survival in the dogwood and none in the other two species. In the 1932 test, including serviceberry and dogwood, 91 percent of the dogwood lived to July 1. Using a solar frame in 1933, good survival was recorded in dogwood and serviceberry, but none in basswood.

Value of watershed cover in flood control, S. B. MORRIS (*Jour. Forestry, 33 (1935), No. 8, pp. 748–750*).—This is a discussion of the relation of watershed cover in preventing floods and in decreasing the silting up of reservoirs, with particular reference to southern California.

Forest fires and accelerated erosion, C. A. CONNAUGHTON (*Jour. Forestry, 33 (1935), No. 8, pp. 751, 752, fig. 1*).—This article presents information on the relation of fire to erosion in central Idaho and emphasizes the need of fire protection as a watershed management measure.

Some relationships between soil type and forest site quality, C. H. DIEBOLD (*Ecology, 16 (1935), No. 4, pp. 640–647, fig. 1*).—In a forest area in central New York characterized by the almost universal presence of hard maple and beech it was determined that lime content of the soil profile, degree of drainage, and depth, structure, and consistency of the subsoil are the characteristics of greatest importance in distinguishing types. All other factors being similar, the well- to moderately-drained soils possessing superior moisture-holding properties developed the best humus layer. The litter of certain species, such as elm, basswood, white ash, hard maple, black cherry, yellow birch, and beech gave rise to better humus than did hemlock, white pine, rock oak, and red oak. A high mortality of coniferous plantings was observed on poorly drained soils.

A study of site, root development, and transpiration in relation to the distribution of Pinus contorta, F. W. Gail and E. M. Long (*Ecology, 16 (1935), No. 1, pp. 88–100, figs. 4*).—Observations on seedlings showed that *P. murrayana* (lodgepole pine) has a shallower absorbing root system and less extensive laterals than has *P. ponderosa.* The usual limitation of lodgepole pine to protected sites is believed the result of its shallower and less extensive root system and also to its tendency to excessive increased transpiration in the presence of winds. In a quiet atmosphere the transpiration rate of lodgepole pine was less than that of ponderosa pine. The lodgepole by virtue of its capacity to produce many short, stubby lateral roots just below the surface of the water in saturated soils was better equipped than the ponderosa in adapting itself to moist environments.

Relation of site index for shortleaf pine to certain physical properties of the soil, T. S. Coile (*Jour. Forestry, 33 (1935), No. 8, pp. 726–730, figs. 3*).—Because of the many physical characteristics and components of each soil horizon and the presence of more than one soil horizon, no well-defined correlation was observed in this study at the Duke Forest between site index and any one physical characteristic or component of any one horizon. A texture-depth index obtained by dividing the silt and clay content, or the colloidal content, in percent, of the B_1 horizon by the average depth in inches at which this horizon was encountered was found a reliable measure of site quality for shortleaf pine. The density and composition of the understory in old-field stands approaching maturity gave a broad index to site quality; for example, dogwood was a common understory on the better sites, whereas certain mosses and lichens characterized poorer sites.

Comparative germination of tree species on various kinds of surface-soil material in the western white pine type, G. M. Fisher (*Ecology, 16 (1935), No. 4, pp. 606–611*).—Eight sections of forest surface soil differing in the character of material in the upper surface layers were lifted and installed intact in a greenhouse and planted with fresh seed of nine species, western white, lodgepole, and ponderosa pines, Douglas and lowland white firs, western larch, Engelmann spruce, western red cedar, and western hemlock. Germination records showed that the nine species as a group and also the individuals were markedly affected by the kind of surface material, with the three most favorable surfaces being ash, duff collected under a stand of virgin western white pine, and rotten wood. The lowest rating was obtained on an undisturbed surface of duff from beneath partially cut western white pine. Sand as a control was next to the lowest.

The relation of temperature and precipitation to the growth of beech in northern Indiana, O. D. Diller (*Ecology, 16 (1935), No. 1, pp. 72–81, figs. 3*).—Yearly variations for the period 1913–33 in the width of annual growth rings in 10 dominant beech trees in each of 7 beech-maple woodlands of northern Indiana were found correlated directly with the total rainfall for June as recorded at nearby stations. There was an inverse correlation with average temperature for the same month. The limiting effects of drought were shown the succeeding year, whereas wet years were followed by increases in growth the same year. The author suggests that a period of drought years would result in a gradual retrogression of the mesic beech-maple type and a corresponding advance in the more xeric oak-maple and oak-hickory types.

Available nitrogen as a factor influencing the occurrence of Sitka spruce and western hemlock seedlings in the forests of southeastern Alaska, R. F. Taylor (*Ecology, 16 (1935), No. 4, pp. 580–602, figs. 6*).—Based on samples of seed beds on cut-over land and periodic analyses of pot cultures of certain seedbed types, the author concludes that the form in which available nitrogen is present is an important factor in determining the occurrence of Sitka spruce and western hemlock seedlings. Small quantities of nitrate nitrogen were correlated with low percentages of Sitka spruce, and as the nitrate nitrogen increased the percentage of spruce also increased until a point of saturation was reached at approximately 50 p. p. m. On the other hand, wherever there was an accumulation of ammonia nitrogen hemlock seedlings were more abundant. Nitrates were not found in large quantity where ammonia was abundant, apparently because of the fact that where conditions favored nitrate formation the ammonia was oxidized into nitrates almost immediately. It was evident that pH and nitrification were related, although the data did not directly show this. The 10 seed-bed types in decreasing order of nitrifying capacity were (1) *Rubus spectabilis* mull, (2) alder mull, glacial, (3) *Sambucus* mull, (4) alder mull, (5) spruce duff, (6) *Fatsia horrida* mull, (7) willow-poplar mull, (8) hemlock-*Vaccinium* duff, (9) hemlock duff, and (10) rotten wood.

Cut-over old field pine lands in central New England: A regional study of the composition and stocking of the ensuing volunteer stands, F. S. McKinnon, G. R. Hyde, and A. C. Cline (*Harvard Forest Bul. 18 (1935), pp. 80, figs. 12*).—Studies conducted by Harvard University in some 225 widely distributed plats of old-field white pine and white pine mixed with hardwoods showed that in 83 percent of the plats pine had been completely replaced by hardwoods and that in the remainder pine would form only a minor part of the ultimate stand. Sufficient valuable hardwoods, such as red oak, white ash, paper birch, and hard maple, were present in most of the young stands to yield a potentially valuable saw-timber crop. The early removal of weed species, such as red maple, gray birch, poplar, and pin cherry, is recommended, particularly when such trees occur in multiple-stemmed forms. Improvement and release cuttings to be most effective should be undertaken before the stands reach 30 yr. White ash, one of the most valuable species, was found unable to compete with other species. White pine to an even greater degree was incapable of competition and could be saved only by timely weedings. Pine is worthy of maintenance only when it occurs in sizable stands. On the better sites hard maple, yellow birch, and basswood make excellent growth and need only the removal of poorly formed or defective trees. In the northern hardwood type well balanced mixtures of paper birch, hard maple, white ash, red oak, and yellow birch gave promise of a highly desirable crop. With reference to slash removal, the oldest stands examined showed no marked evidence of variations in density of stocking attributable to slash.

Growth rate of second growth hardwoods, R. H. Westveld (*Michigan Sta. Quart. Bul., 18 (1935), No. 1, pp. 32–35*).—Observations in a mixed hardwood stand in the college woodlands indicated that dominant and codominant trees were not only making the more rapid growth but were exhibiting less mortality than suppressed trees. Species in the dominant class varied decidedly in their growth rate, hop hornbeam making the slowest and American elm and white oak the most rapid growth. The need of adequate spacing is stressed.

Power pruning, J. B. Cuno (*Jour. Forestry, 33 (1935), No. 8, pp. 753, 754, fig. 1*).—The construction and operation of a light-weight, power-driven pole saw developed at the U. S. D. A. Forest Products Laboratory is discussed.

Converting factors and tables of equivalents used in forestry, E. N. Munns, T. G. Hoerner, and V. A. Clements (*U. S. Dept. Agr., Misc. Pub. 225 (1935), pp. 59, figs. 20*).—The purpose of this pamphlet is to provide members of the Forest Service with conversion factors for metric units and forest measurements that are more or less frequently encountered in the literature.

DISEASES OF PLANTS

Crop losses from plant diseases in the United States, 1931, 1932, and 1933, compiled by J. I. Wood (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1935, Sup. 87, pp. 82*).—This compilation presents tabulations of estimates for wheat, barley, rye, oats, corn, sweet corn, sweetpotato, potatoes, tomatoes for manufacture, tomatoes for market, dry beans, snap beans, cotton, sugar beet, apple, pear, peach, cherry, plum and prune, grape, raspberry, and strawberry.

The Plant Disease Reporter, October 1, 1935 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 19 (1935), No. 16, pp. 249–269*).—Among other data on plant diseases, the following are included:

Soybean downy mildew in Illinois (due to *Peronospora manshurica*, first reported in 1929 and now assuming considerable importance), by G. H. Boewe; forest seedbed diseases in Georgia and South Carolina, by J. H. Miller; Dutch elm disease eradication (from reports of the Bureau of Entomology and Plant Quarantine for the weeks ended September 14 and 21); and a plant disease survey of trees and shrubs in western Massachusetts (the diseases being listed for the following trees: Species of *Ulmus, Acer, Salix, Populus, Betula, Quercus, Pinus, Picea, Tsuga, Tilia, Fraxinus*, and *Fagus;* and shrubs: Species of *Azalea, Rhododendron, Berberis, Castanea, Cornus, Lonicera, Staphylea*, and *Symphoricarpos*), by W. H. Davis.

[Plant disease studies in New York] (*N. Y. State Conserv. Dept. Ann. Rpt., 23 (1933), pp. 107–119, 123, 125–129, 130, fig. 1*).—Under the report of the division of lands and forests, progress reports of work on the following diseases are outlined: The white pine blister rust, including progress on the eradication of gooseberries and black currants in State reforestation areas and forest preserves, in State nurseries, State parks, county reforestation areas, community and industrial forest lands, and private lands; emergency conservation work camps on blister rust control; and removal of blister rust infections on white pine. Note is made of losses in transplant beds, particularly in red pine, associated with a *Fusarium* and with drought conditions. As a result of extensive surveys and fungus isolation studies, a canker on balsam (*Abies balsamea*) is ascribed primarily to *Cryptosporium macrosporium*, and its incidence and the damage caused are reported.

Notes are also included on an unidentified fungus causing staghead of red pine. Infection occurs through insect injuries to the needle fascicles and stems.

Mycological notes for 1930–32, L. O. Overholts (*Mycologia, 25 (1933), No. 5, pp. 418–430, pls. 3*).—This contribution from the Pennsylvania State College is a continuation of previous reports descriptive of the more important fungi of the year with their hosts or other substrates. Notes are included on 34 species of fungi distributed among 4 subclasses. These records cover species collected in Pennsylvania for the first time, species not previously reported in the United States, and 1 new species (*Septoria hypoxi*) on living leaves of *Hypoxis*.

Some miscellaneous fungi of the Pacific Northwest, S. M. Zeller (*Mycologia, 27 (1935), No. 5, pp. 449–466, figs. 3*).—Among other fungi discussed in this paper from the Oregon Experiment Station are included 1 new genus, 4 new species, 2 new combinations, 4 species new to America, and 86 new to Oregon.

[Plant disease studies in Puerto Rico] (*Puerto Rico Col. Sta. Rpt. 1934, pp. 57–64, 85–89, 125–141*).—In the report of the sugarcane expert (P. Richardson Kuntz) at the Isabela Substation, summaries are given of studies on the relative resistance to mosaic disease of the most promising Puerto Rican and imported varieties of sugarcane in three mosaic-infested zones (Juncos-Caguas, Manatí Valley, and San Sebastián section) and of similar studies in cooperation with the United Puerto Rico Sugar Company (some varieties giving promising results and to be further tested).

In the report of the division of botany and plant pathology, by M. T. Cook, the following studies are discussed: New disease records (banana freckles due to *Cercospora*, cankers on the leaves and stems of poinsettia, damping-off of citrus and sugarcane due to *Rhizoctonia*, a *Helminthosporium* leaf spot of lawn grass, and a stem rot of the newly introduced Maryland Golden variety of sweetpotato); studies of root diseases of sugarcane (including nonparasitic degeneration, nematode injury, a new but unnamed fungus parasite, and attack by *Pythium* sp.); poor germination of sugarcane; breeding of cucumbers for resistance to mildew (*Peronoplasmopara cubensis*) (with the Chinese Long variety and its crosses with Black Diamond and Always Green giving most promise); breeding of tomatoes for resistance to bacterial wilt (*B[acillus] solanacearum*) (with a number of selections showing fixation of resistance); breeding of eggplants for resistance to the same bacterial wilt (including progress with crosses of a highly resistant noncommercial variety); breeding for a filler tobacco resistant to mosaic (with the selection of 40 crosses for further testing and fixing); and genetic studies on the mechanism of mosaic resistance (with data on F_2 and backcross progenies). Minor studies were made on a fungus fruit rot of cucumbers and on a stem rot of sweetpotato of undetermined cause and hitherto unreported from Puerto Rico. This section is concluded with a survey recording, under 40 host plants, all the important and many of the minor diseases noted during the preceding year.

Report of the mycologist, R. Leach (*Nyasaland Dept. Agr. Ann. Rpt., 1934, pp. 24–26*).—This consists of notes and progress reports of studies on tea diseases (collar scorch, including the relation of *Rhizoctonia bataticola* to it, and flush scorch); coffee bark disease (apparently due to a *Fusarium* similar to, if not identical with, *F. lateritium*); mango stem canker, angular leaf spot, and fruit scab and rot, and avocado fruit scab, all with symptoms resembling bacterial and fungus diseases but due to the capsid bug *Helopeltis bergrothi*; tea storage and germination; and general cultural data from the Mlanje Experiment Station.

Diseases of the banana and of the manila hemp plant, C. W. Wardlaw (*London: Macmillan & Co., 1935, pp. XII+615, [pls. 2], figs. 294*).—In this volume an attempt has been made to present a comprehensive account of the fungus and bacterial diseases of bananas compiled from a wide variety of sources, including the author's own investigations.

Following an introductory chapter on banana cultivation, section 1 deals with soil-borne, vascular, and stem diseases; section 2 with plantation diseases of the fruit and diseases of the leaves; section 3 with virus diseases; and section 4 with storage disease of banana and manila hemp. Appendixes give lists of bacteria and fungi associated with bananas as saprophytes and parasites, strains of *Fusarium cubense*, imports of bananas into Great Britain, and conditions on shipboard.

A literature list of 559 titles and an index are included.

The perfect stage of Cercospora rubi, F. A. Wolf (*Mycologia, 27 (1935), No. 4, pp. 347–356, figs. 8*).—From studies of its morphology and development, C. *rubi* was found to possess a perithecial stage initiated in the fall by the formation of spermagonia and archicarps. The genetic connection between the conidial and perithecial stages was established in culture. The synonymy of the conidial stage is discussed, but since the perithecial stage could not be identified with any previously described *Sphaerella* on *Rubus* it is described as *Mycosphaerella dubia* n. sp.

Sphaeria zeae (Diplodia zeae) and confused species, C. L. Shear and N. E. Stevens (*Mycologia, 27 (1935), No. 5, pp. 467–477, figs. 2*).—The authors review the history of the taxonomy of this fungus and conclude that in spite of a literal violation of the International Code the name *D. zeae*, which has been in general usage for over 50 yr., should be continued until its perfect stage, if any, is found.

Soil and Fusarium diseases, O. A. Reinking (*Zentbl. Bakt.* [*etc.*], *2. Abt., 91 (1935), No. 11–15, pp. 243–255*).—The author reviews the literature (including a list of 56 titles) on correlations of soil conditions with the *Fusarium* wilts and root rots of plants, and then details his own study of banana wilt in relation to soil type, pH, and average number of organisms per gram of soil. The main conclusions are as follows:

The various *Fusarium* diseases are apparently closely correlated with soil conditions, and the studies on banana wilt indicated a distinct correlation of severity of infection with prevalence of the causal organism in the soil and the soil type, regardless of the pH of the soil. The disease was most severe on the sandy and less severe on the clay soil types. It was found that the parasite *F. oxysporum* f. 3 establishes itself easily in sandy soils with large numbers per gram of soil, but with difficulty in clay soils where it is limited to comparatively small numbers per gram of soil. The explanation for such differences remains undetermined. Counts of the pathogen in the soil around infected plants also indicated a greater abundance in badly diseased than in slightly diseased areas.

It is apparently shown by this study of banana wilt that the number of organisms in the soil is the determining factor in the amount of disease and in the rate of its spread, and that the marked difference in severity on different soil types is of great importance in the development of control measures. In fact, it has been possible to classify soils as to disease severity and to plant accordingly, and the use of sanitary measures should be based on plantings made according to the different soil types. Apparently the ability of the banana wilt *Fusarium* to exist for years in the soil saprophytically varies with the soil type.

Studies on the variability of pathogenicity and cultural characters of Gibberella saubinetii, A. J. Ullstrup (*Jour. Agr. Res.* [*U. S.*], *51 (1935), No. 2, pp. 145–162, figs. 8*).—Ascospores of *G. saubinetii* were isolated in sets of eight from single asci in perithecia collected in Illinois, Iowa, and Minnesota.

All ascosporic and hyphal-tip colonies on first isolation were alike in cultural characters, regardless of geographical origin. However, after a relatively short period in pure culture, during which frequent and regular, single-conidial transfers were made, marked changes in cultural behavior arose in most of the isolates. The kind of medium, frequency of transfer, or geographical origin of the culture apparently bore no relationship toward the tendency to vary.

The isolates which, in general, did not change in cultural characters and which also gave a rapid radial growth and an abundance of aerial mycelium were always highly pathogenic, while the variant types which also gave a relatively slow rate and a pionnotes type of growth were generally poor pathogens. No correlation could be established between abundance of conidia and pathogenicity. Passage through the host or through the ascigerous stage in the laboratory failed to restore pathogenicity to the variants or to bring back their original cultural behavior.

The sudden and fortuitous changes suggest mutation as the most tenable explanation of variation. If variants arise under natural conditions, they are probably eliminated through competition and natural selection of the more vigorous type.

Factors affecting the sporulation of Phyllosticta solitaria in artificial culture, A. J. Mix (*Kans. Acad. Sci. Trans., 36 (1933), p. 105*).—Solid media proved more conducive to sporulation than fluid media, and reduction in amount of nutrients had perhaps the greatest influence in inducing spore formation, which may occur in media initially at from pH 4.2 to 5.8. A modified Coons' solution proved especially favorable.

The production of asexual spores by Pleurotus corticatus, F. Kaufert (*Mycologia, 27 (1935), No. 4, pp. 333–341, pls. 6*).—From studies at the Minnesota Experiment Station, the author describes the production of asexual spores, which he succeeded in inducing in *P. corticatus*, and also, apparently for the first time in an agaric, the formation of conidia on coremia.

Fairly large sporophores were produced on a medium composed of basswood sawdust and malt extract.

It was established that the fungus is heterothallic.

Physiological studies on Rhizobium, III, IV (*Jour. Bact., 30 (1935), Nos. 1, pp. 33–42, figs. 4; 2, pp. 173–187, figs. 6*).—These papers continue studies at the Iowa Experiment Station (E. S. R., 72, p. 164).

III. *Respiration and growth as influenced by the reaction of the medium*, D. W. Thorne and R. H. Walker.—The following results are reported:

The respiration and growth of representative strains of *R. meliloti* and *R. japonicum* as a function of the pH of the medium were measured by the Warburg manometric technic. The growth of *R. meliloti* in glucose yeast extract media decreased from a maximum at pH 7.0 to 0 at from pH 4.6 to 4.9 in the acid and at pH 9.6 in the alkaline range. The growth of *R. japonicum* in arabinose yeast extract media decreased from a maximum at from pH 6.7 to 6.9 to 0 at pH 4.2 and 9.5. The initial rate of respiration for the two species reached a maximum at from pH 7.2 to 8.0 and decreased to a very small value at the critical pH for the respective species. In both cases the optimum reaction for respiration was more alkaline than that observed for growth.

Since the respiration of the two species responded almost identically to changes in the reaction of the medium, it is concluded that there is probably a close relationship in their respiratory mechanisms.

IV. *Utilization of carbonaceous materials*, O. R. Neal and R. H. Walker.—*R. meliloti* showed no significant differences in the rate and extent of oxygen consumption in media containing glucose, mannitol, or sucrose, but galactose and arabinose proved superior to glucose for utilization on both nitrate and ammonium media. Maltose, lactose, inositol, dulcitol, and sorbitol with both forms of nitrogen, and raffinose and erythritol with ammonium nitrogen were decidedly inferior to glucose as energy sources. Ammonium nitrogen seemed more suitable for utilization than nitrate nitrogen as measured by the total oxygen consumption.

As a source of energy for *R. japonicum*, arabinose proved distinctly superior to the other carbonaceous compounds studied. Glucose, galactose, and xylose permitted approximately equal amounts of oxygen consumption. Mannitol, mannose, maltose, glycerol, lactose, sucrose, and erythritol were utilized but slightly or not at all. Unlike *R. meliloti*, nitrate nitrogen appeared more suitable for utilization by this species than ammonium nitrogen.

Two rusts hitherto unreported on economic hosts from the Philippine Islands, G. O. Ocfemia (*Philippine Agr., 23 (1935), No. 10, pp. 880–885, figs. 3*).—In 1932 several banana plants near the buildings of the College of Agriculture at Laguna were found heavily infected with *Uromyces musae*, and in February 1934, leaves of eggplant bearing both pycnia and aecia of *Puccinia tubulosa* were received from Zambales Province. The latter fungus is heteroecious and occurs in the Philippines on the telial and uredial host *Digitaria sanguinalis*. Both fungi are described and figured and the host symptoms indicated.

Perfect stage of Sclerotium rolfsii Sacc. in culture, B. B. Mundkur (*Indian Jour. Agr. Sci., 4 (1934), No. 4, pp. 779–781, pl. 1*).—In this preliminary note the author states that *S. rolfsii* developed the sexual stage on a special medium containing onions, asparagine, and proteose peptone, appearing in from 40 to 45 days after inoculation and at the optimum temperature (from 30° to 31° C.) for growth of the fungus. In size and morphology it agreed with the description of *Corticium rolfsii* by M. Curzi, and it is tentatively placed in that species.

Some cases of spontaneous infection with true tobacco ring spot virus [trans. title], R. W. Böhme (*Phytopath. Ztschr., 6 (1933), No. 5, pp. 507–515, figs. 9*).—Approximately 2 percent of the seedlings from a pure line of Turkish tobacco (variety Samsun) showed the presence of a ring spot virus. The symptoms indicated that it had become attenuated, and not until it had been passed through the tobacco plants several times did it show an increase in virulence. Transmission through other suscepts proved the virus to be that of the true tobacco ring spot. Only local infection was obtained on the Paul Krüger variety. The disease occurred spontaneously in a field of Ackersegen potatoes, producing yellow mottling symptoms. Inoculations were made in various combinations with the X and Y viruses, and the symptoms on the different hosts are described.—(*Courtesy Biol. Abs.*)

A description of a narcotic virus disease affecting tobacco and other plants, K. M. Smith and J. G. Bald (*Parasitology, 27 (1935), No. 2, pp. 231–245, pls. 2, figs. 2*).—The authors recount their studies of an apparently undescribed virus disease which appeared spontaneously in greenhouse seed boxes on seedlings of *Nicotiana tabacum* and *N. glutinosa*. The symptoms on a number of hosts are given.

The chief characteristic of the virus is its failure to become systemic in any host thus far tested, though it was occasionally found in the roots of young tobacco plants (usually those which had been spontaneously infected). Its dilution end point appeared to be about 1:10,000 and its longevity in extracted sap about 20 days. It resembled tobacco-mosaic virus in the small size of its particles (from 20 to 30 mμ in diameter) and in its high resistance to alcohol (viable in 99 percent alcohol for at least 71 hr.), but differed in its rapid inactivation at ordinary temperatures and in its lower thermal death point (72° C.). This necrosis was clearly distinct from the American tobacco ring spot, but somewhat resembled the ring spot virus described from Germany by R. W. Böhme (see above), though the latter became systemic in potato and other hosts.

No positive evidence on the dissemination of the disease in nature has been obtained, but the experiments in this respect have been limited. However, the disease was experimentally transmitted to healthy cowpeas by spraying with a virus suspension.

Bacteriophage in tropical agriculture [trans. title], J. Dufrenoy (*Rev. Bot. Appl. et Agr. Trop., 15 (1935), No. 167, pp. 497–506*).—This is a review of work on the interrelationships of bacteriophages with phytopathogenic bacteria and soil micro-organisms, including a discussion of their significance to plant pathology and to the legume nodule bacteria and general remarks on the methods of bacteriophagy.

An electric soil pasteurizer, J. G. Horsfall (*Farm Res.* [*New York State Sta.*], *2 (1935), No. 1, p. 7*).—This note reports excellent results by the method previously described (E. S. R., 73, p. 56).

Diseases of cereal crops in Kenya Colony, C. A. Thorold (*Kenya Dept. Agr. Bul. 2 (1935), pp. [5]+60, pls. 16, fig. 1*).—This comprises a general account of the diseases of maize, wheat, oats, barley, rye, and sorghums and millets, summarizing the observations of the author and other members of the staff of the Kenya Department of Agriculture, as well as more extensive investigations carried out elsewhere.

Inheritance of resistance to mildew, Erysiphe graminis hordei, in a cross between Hanna and Atlas barley, F. N. Briggs (*Jour. Agr. Res.* [*U. S.*], *51 (1935), No. 3, pp. 245–250*).—From a study at the California Experiment Station of the inheritance of resistance to mildew (*E. graminis*) in a cross between Hanna and Atlas barley, it was shown that Hanna differs from Atlas in one factor for resistance and that susceptibility is incompletely dominant. There was no indication of linkage between resistance and one factor pair each in linkage groups 1 and 2. Crosses are being made involving character pairs in other linkage groups, and it is hoped to place the disease-resistant factor definitely in one of the linkage groups to serve as a basis for the transfer of resistance to the important barley varieties grown in California.

Bacterial leaf spot of alfalfa, A. J. Riker, F. R. Jones, and M. C. Davis (*Jour. Agr. Res.* [*U. S.*], *51 (1935), No. 2, pp. 177–182, fig. 1*).—A bacterial leaf spot of alfalfa observed at Madison, Wis., was studied cooperatively by the Wisconsin Experiment Station and the U. S. D. A. Bureau of Plant Industry. The symptoms, including the "water-soaked" spots, are described, and the successful isolation and inoculation studies are detailed. On the basis of the morphological and physiological characters of single-cell isolates from six cultures of the causal organism, it is described as a new species under the name *Phytomonas alfalfae.*

Bean mosaic menaces important crop, A. L. Harrison (*Farm Res.* [*New York State Sta.*], *2 (1935), No. 1, pp. 1, 3, fig. 1*).—The author reports from 90 to 100 percent of the plants infected with mosaic in fields of canning beans visited during the preceding 3 yr. Delayed blooming of infected plants was noted, making more pickings necessary, and the disease also reduced both the yield and the quality of the pods.

The station started work on the development of resistant or immune strains or varieties in 1932, and during the 1935 season several selections gave promising results.

Breeding snap beans for mosaic resistance.—A progress report, C. H. Mahoney (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 483, 484; abs. in Michigan Sta. Quart. Bul., 18 (1935), No. 1, p. 63*).—This is a progress report on work at the Michigan Experiment Station, with the object of developing late varieties or strains of snap beans either resistant or tolerant to mosaic, in which a large number of selections from commercial varieties and from several crosses have been tested for 4 yr. under field conditions and with ample facilities for infection and spread. Details are given of the results to date with certain promising selections and crosses, and with the application of Fisher's analysis of variance method to pod lengths for 17 progenies to determine whether there was segregation among progenies in the F_4 to F_8 generations.

New mosaic-resistant Refugee bean is developed, W. A. Pierce and J. C. Walker (*Canning Age, 15 (1934), No. 2, pp. 83, 84*).—In this cooperative investigation between the Idaho and Wisconsin Experiment Stations, the authors crossed the mosaic-resistant Corbett Refugee bean with the susceptible but otherwise more desirable Refugee Green. From the progenies two strains (W-1 and W-3) resistant to common bean mosaic were obtained which measured favorably in canning qualities with the Refugee Green parent and one of which (W-1) gave a picking 5 days earlier and reached its peak yield 10 days earlier than W-3 or either parent. These two promising strains have been released to seedsmen under the names of Idaho Refugee (W-1) and Wisconsin Refugee (W-3).

Calcium cyanamide in relation to control of clubroot of cabbage, J. C. Walker and R. H. Larson (*Jour. Agr. Res. [U. S.], 51 (1935), No. 2, pp. 183-189*).—In this cooperative investigation between the University of Wisconsin and the U. S. D. A. Bureau of Plant Industry, a continuation of previous work on clubroot (*Plasmodiophora brassicae*) control (E. S. R., 71, p. 654), the authors studied the effects of calcium cyanamide ($CaCN_2$) when applied to clubroot-infested soil.

In greenhouse tests with soil at pH 6.4, $CaCN_2$ at the rate of 250 lb. per acre prevented infection, while 525 lb. of calcium hydroxide ($Ca(OH)_2$) was required for the same result. When $CaCN_2$ was compared with corresponding amounts of $Ca(OH)_2$ and urea resulting from its hydrolysis, the fungicidal effect of $CaCN_2$ was greater, indicating its toxicity to be due not only to basic substances formed from it but also to the CN_2 anions in the soil solution before hydrolysis is complete.

Much larger amounts of $CaCN_2$ were required to reduce infection in the field than in the greenhouse. This parallels the results with $Ca(OH)_2$ in the earlier series of experiments, and the differences in both cases are interpreted as due to the influence of soil environment.

From the results of both greenhouse and field tests, it is concluded that, pound for pound, $CaCN_2$ is roughly about twice as effective as $Ca(OH)_2$ for clubroot control.

Where soil acidity needs to be corrected for reduction of clubroot, $CaCN_2$ may be used up to the point where the need for available nitrogen is satisfied. If further neutralization is required, $Ca(OH)_2$ may be used to supplement it.

Bacteriosis of celery due to Bacillus carotovorus [trans. title], E. Baldacci (*Atti Ist. Bot. R. Univ. Pavia, 4. ser., 5 (1934), pp. 77-119, figs. 10; Eng. abs., p. 116*).—The author isolated a micro-organism from diseased celery, studied its cultural, morphological, and biochemical properties, proved its pathogenicity by successful inoculations, and identified it as *B. carotovorus*.

A bacterial rot of Lactuca sativa capitata and Cichorium endivia [trans. title], C. Stapp (*Zentbl. Bakt. [etc.], 2. Abt., 91 (1935), No. 11-15, pp. 232-243, figs. 3*).—A rot of head lettuce (*L. sativa capitata*) and endive (*C. endivia*) due to a fluorescent denitrifying bacterium is described. Since it was also shown to be virulent for *C. intybus*, its identity with *Pseudomonas intybi* is considered very probable.

In addition to this fluorescent form, *P. syringae*, the cause of lilac blight, was also shown to be pathogenic for lettuce. A series of other fluorescent and phytopathogenic bacteria tested on lettuce proved entirely nonvirulent.

Control measures are suggested.

Seed transmission of mosaic in inbred lines of muskmelons (Cucumis melo L.), C. H. Mahoney (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 477-480;*

abs. in Michigan Sta. Quart. Bul., 18 (1935), No. 1, p. 64).—Of 48 inbred progenies at the Michigan Experiment Station, 6 showed seed-borne transmission, the average infection of the 6 being 24 percent. In further selections from these progenies in the field every infected plant transmitted mosaic through the seed, the average transmission from all infected plants being 15.6 percent. Seed from noninfected plants from the same progenies gave no seed transmission. Since these percentages are extremely high as compared with Kendrick's data (E. S. R., 72, p. 351), the question is raised as to whether the differences may not be attributed to a higher susceptibility to infection and seed transmission in certain inbred lines.

St. John's disease of pea in Europe, W. C. Snyder (*Zentbl. Bakt. [etc.], 2. Abt., 91 (1935), No. 22–26, pp. 449–459, figs. 2*).—On the basis of his survey in central Europe during the summer of 1934, the author (University of California) analyzes the Fusariums associated with "St. John's disease" of peas. Although originally applied to a single disease attributed to *Fusarium vasinfectum pisi*, the name now stands for a disease complex with the general symptoms of yellowing and premature death. This name has been applied not only to *Fusarium* diseases, but also to *Ascochyta* foot rots, virosis, etc., of peas.

From diseased peas the following were isolated: *F. redolens*, *F. solani martii* f. 2, *F. oxysporum* f. 8, *F. herbarum avenaceum*, and *F. culmorum*. Inoculation tests indicated the foot and root rot of peas due to *F. solani martii* f. 2 to be symptomologically and etiologically identical with the *Fusarium* root rot of peas in America. On the basis of cultural comparisons, *F. solani striatum*, reported as infecting peas in the Netherlands, is considered a synonym of *F. solani martii* f. 2.

Isolations of *F. oxysporum* from peas in Europe agreed with its form 8, the cause of near wilt of peas in America. This disease is here called "St. John's wilt" to distinguish it from the pea disease group usually included under the name St. John's disease, and it is considered identical with near wilt.

The American wilt due to *F. orthoceras pisi* has not yet been reported from Europe. Although the pathogenicity of the other Fusariums isolated was not fully tested, studies by others indicate that they may be etiologically concerned in disease under certain conditions of pea culture.

Some ecologic relations of the potato and its chief fungous parasite, Phytophthora infestans, W. Crosier and D. Reddick (*Amer. Potato Jour., 12 (1935), No. 8, pp. 205–219*).—This contribution from the New York State and the [New York] Cornell Experiment Stations, involving direct experimentation and a critical review of the literature, led to the following conclusions:

The susceptibility of potato plants to attack by *P. infestans* is not known to be altered by meteorological variability during the growing period.

The most important external factors in the rapid spread of the disease are temperature and humidity. A relative humidity of 95 percent or over must be maintained for about 8 hr. for the development of a germinable sporangium, and water in the form of rain or dew must be present for germination, swarming, and infection. Chilling is also necessary for the stimulation of germination. When the effective external factors occur at the proper time for optimum development of the fungus, a very high humidity must be maintained for at least 11 or 12 hr. to permit infection.

In the partial or complete absence of leaf blight, tuber rot may occur through direct infection of new tubers by mycelium from affected seed pieces in the soil. Such tubers perpetuate the fungus and explain the wide-spread incidence of the blight that may follow a season with little or no leaf infection.

The spread from a center is so slow and the sensitiveness of the sporangia to drying is so great that the development of blight in widely separated areas at about the same time is unexplainable on the basis of migration of the fungus.

Histological studies of the internal rust spot ("Eisenfleckigkeit") of potato tubers [trans. title], L. Pasinetti (*Riv. Patol. Veg., 25 (1935), No. 5–6, pp. 185–227, figs. 21*).—From the detailed histological and cytological study here described, the author maps out the successive stages of the internal rust spot of potato tubers. From these data, and in the absence of any proof that the disease is due to a micro-organism, the rust spot is regarded as an alteration primarily of physiological nature induced partly by environmental conditions and partly by a natural predisposition of the cells resulting from degeneration in varieties long cultivated under conditions differing widely from those in their native habitat.

Investigations in potato samples of the relations between tuber potential and virus infection [trans. title], E. Köhler and A. Hey (*Zentbl. Bakt.* [*etc.*], *2. Abt., 91 (1935), No. 11–15, pp. 256–267, fig. 1*).—Using potato samples of different origin, the authors endeavored to determine whether a relation exists between tuber potential (method of H. Wartenberg and A. Hey) and infection with virus diseases. In general, it was found that when the sample tubers were halved and one-half was used for potential measurement and the other for virus determination infections with the degeneration viruses were correlated with definite deplacements of the potential values toward the negative end of the millivolt scale. On the contrary the nondegeneration viruses, to which the varieties used were highly tolerant, were not indicated by any such shifts in potential.

These results strongly support the authors' earlier contention (1934) that shifts in the potential are a symptom of infection with the degeneration viruses. However, the virus itself is not to be regarded as the direct cause of the shift, but rather the metabolic changes induced by it. When the virus does not affect the metabolism of the host, measurement of the potential fails to indicate its presence. Thus when the pathogenicity of a virus for a particular variety is limited or nil, its influence on the potential is also limited or nil. Potential determinations therefore become indicators of active "degeneration."

Sometimes tuber samples exhibit potential values which do not correspond to the etiological agents. Such deviations probably depend on the facts that tubers from primarily infected plants not infrequently show a too limited virus content or that the virus is unequally distributed in them.

There is also a basis for the view that potential shifts of limited degree and in both directions are possible without participation of the virus factor. How far they may be a sign of the so-called "ecological degeneration" is conjectural.

According to the results of this study the most frequent and important viruses are those of leaf roll and of the mosaics of the "X" and "Y" groups (ring mosaic and streak viruses). Doubtless other viruses than those named occur in the tubers, but for this study they were, in any event, of secondary significance. The leaf roll virus and the combination of the X with the Y virus were in all cases malignant, and the strongest shifts in potential were as a rule traced back to such infections.

Yellow dwarf disease of potatoes, J. H. Muncie (*Michigan Sta. Spec. Bul. 260 (1935), pp. 18, figs. 7*).—The severe outbreaks and rapid increase in local incidence of this disease in Michigan led to an intensive study of the cause and means of dissemination, with the following results:

The symptoms are more clearly expressed and the effects more severe at high temperatures, and the disease is due to a virus capable of transmission by tuber grafts and by insects, especially the potato leaf hopper (*Empoasca fabae*) and the potato aphid (*Macrosiphum solanifolii*). Transmission tests with infected soil or with inoculation by needles or by hypodermic injections gave negative or doubtful results.

Measures for control are discussed, and recommendations include the use of disease-free seed, thorough roguing throughout the growing season, and spraying for control of the insect vectors.

Studies on the influence of some environmental factors on the susceptibility of the rice plant to blast and Helminthosporium diseases and on the anatomical characters of the plant, I–III, H. Suzuki (*Jour. Col. Agr., Imp. Univ. Tokyo, 13 (1934), No. 1, pp. 45–108, pls. 2; 13 (1935), No. 3, pp. 235–275, pl. 1; 277–331, pl. 1*).—Three papers are here given.

I. *Influence of differences in soil moisture.*—The results of inoculation tests with the blast fungus (*Piricularia oryzae*) and with *H. oryzae* on resistant, susceptible, and upland varieties of rice showed that regardless of the variety or growth stage the susceptibility increases in inverse ratio to the soil moisture.

Regardless of the variety, the outer walls of the epidermal cells in the same parts of the leaves or spike pedicels were thicker in plants on flooded than on dry soil and also thicker in the resistant variety Mubôaikoku than in the susceptible variety Kairyôshinriki. The outermost layers of these walls contained sufficient silica to be distinguished easily by soaking transverse sections in phenol. Measurements of this siliceous outer layer indicated that regardless of variety it was thicker in plants on flooded than on dry soil, and in the Mubôaikoku than in the Kairyôshinriki variety. As shown by the differential staining of leaves with safranine and phenol (Grob's method), the degree of cuticularization and silicification in plants grown on flooded soil was higher than that in plants on dry soil, regardless of the variety or of the position or part of the leaf. The number of siliceous epidermal cells per unit area was also greater in plants on flooded than on dry soil, and in Mubôaikoku than in Kairyôshinriki. One or both guard cells of the stomata sometimes contained as much silica as the siliceous epidermal cells, and the relation of such cells to the soil moisture and variety was the same. Furthermore, the size of the dumbbell-shaped rice cells was greater on plants on flooded than on dry soil and in Mubôaikoku than in Kairyôshinriki. The data apparently indicate that the degree of silicification is greatest toward the tip of the leaf and decreases toward the base.

A correlation of all the results obtained would seem to indicate that the susceptibility of rice to these two diseases is closely related to the thickness of the outer walls and of the siliceous outer layers of these walls of the epidermal cells, to the numbers of the siliceous epidermal cells or stomata, to the size of the dumbbell-shaped cells, and to the number of the siliceous short cells. The number and size of the stomata are not regarded as significant. An increase in the susceptibility of rice to blast or *Helminthosporium* disease under arid conditions seems to be due in part to an inhibition of normal development. The resistance of a variety to blast is apparently due in part to its ability to develop to a higher degree these properties which resist fungus penetration.

II. *Influence of differences in soil moisture and in the amount of nitrogenous fertilizer given.*—Inoculation tests with the blast fungus on seedlings and spike pedicels and from spontaneous infections of adult plants grown on soils differing in moisture and in fertilizer treatments indicated that the extent of infection was lowest in flooded soil with half the unit amount of nitrogenous fertilizer, followed by the same soil with the unit amount of fertilizer, and highest in dry soil regardless of the amount of fertilizer. Both water supply and the amount of nitrogenous fertilizer are regarded as factors in the development of resistance, but the former is the more important.

Counts of the siliceous epidermal cells and stomata and of the siliceous short cells of the spike pedicels and measurements of the dumbbell-shaped cells were correlated with the extent of infection obtained in these studies, and indicated that the more highly were these anatomical properties developed the less was the infection.

The number of stomata per unit area on the lower leaf surface, as well as on the spike pedicels, was greatest on flooded soils with half the unit amount of fertilizer, followed by such soils with unit amount of fertilizer, and smallest on dry soils regardless of the amount of fertilizer. The number on the upper leaf surface showed no consistent tendency to vary with the change in these conditions. In these studies the number of stomata tended to vary inversely with susceptibility to infection.

The size of the stomata, including both guard cells, may be correlated with the size of the stomatal pores through which the fungus sometimes enters. Measurements indicated the stomata to be larger on flooded than on dry soils regardless of the amount of fertilizer or the size of the leaf, and to be larger on flooded soils with unit fertilizer than on dry soils with half the unit, but to be smaller than on flooded soils with half the unit fertilizer. The stomatal size on the spike pedicels showed no consistent tendency to vary with differences in either soil water or fertilizer.

III. *Influence of differences in soil moisture and in the amounts of fertilizer and silica given.*—Regardless of the amount of fertilizer or silica given, the susceptibility to blast and to infection with *H. oryzae* varies inversely with the water content of the soil. Susceptibility to blast is lower on flooded soils without added silica than on dry soils with it. Resistance to blast increases with increase in the silica supply and with decrease in the amount of fertilizer only when the soil contains sufficient soil water.

Differences in the cellular properties offering resistance to penetration by the two fungi are shown to be closely correlated with variations in the susceptibility of rice to the two diseases which they cause. Increase in the susceptibility induced by soil dryness and to the blast disease by excessive nitrogenous fertilization seems to be due, in part, to inhibition of the normal development. The number of the siliceous epidermal cells and stomata and the size of the dumbbell-shaped cells appear to be definite criteria for comparing the degree of silicification in the epidermal tissues of the leaf and the number of siliceous short cells for that of the epidermal tissues of the spike pedicel.

Regardless of the leaf position or the amounts of fertilizer and silica applied, the number of siliceous epidermal cells, stomata, and short cells, and the size of the dumbbell-shaped cells are greatest in the upper part of the leaf, and decrease toward the base. The number and size of the stomata are not considered significantly related to the susceptibility of rice to these two diseases.

Mosaic disease of sugarcane in the State of Ceará, Brazil [trans. title], A. DA CUNHA BAYMA (*Campo* [*Rio de Janeiro*], *4* (*1933*), *No. 7, pp. 74–78, fig. 1*).—From sugarcane plantations at Cariri, Ceará, supposedly infected through cuttings introduced from the States of Recife (Pernambuco) and Sergipe, mosaic has spread over most of the State. Infection of from 30 to 100 percent prevails, resulting in a decrease of 80 percent in sugar production.

Official measures in introducing resistant varieties handed over directly to planters resulted in complete failure, owing to delays in transportation. Furthermore, after a time many imported varieties proved susceptible. It is therefore suggested that all imported varieties, together with the local resistant canes, be first tested in experimental fields.—(*Courtesy Biol. Abs.*)

Is resistance to bacterial wilt in sweet corn heritable? C. H. Mahoney and J. H. Muncie (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 458–473; abs. in Michigan Sta. Quart. Bul., 18 (1935), No. 1, pp. 63, 64*).—The conclusions from this investigation by the Michigan Experiment Station are as follows:

When the percentage of infected [*Aplanobacter stewarti*] plants in the field was taken as the criterion of wilt resistance, top-crossed Bantam, Bantam Evergreen hybrids, Golden Cross Bantam, and Kingcrost were no more resistant than open-pollinated varieties of comparable maturity date.

There was a high negative correlation between final wilt percentage and days to edible maturity in 1933, a negative one between final wilt percentage and yield of marketable ears in 1933 and 1934, but no correlation between seedling wilt and final wilt readings in the field or yield of marketable ears in 1933.

When the regression coefficient was used to predict the wilt percentage, using days to maturity as the independent variable, (1) the deviations of the predicted from the actual percentage of wilt for 7 F_1 inbred Bantams selected for resistance were not significant, (2) when 14 hybrid strains of corn grown in 1933 were tested, 7 showed apparently significant minus deviations, but Golden Cross Bantam did not, and (3) when tested for homogeneity by the chi-square method both subsamples appeared to be taken from a homogeneous population.

The early maturing strains (up to 75 days) grown in 1934 had markedly less wilt than the later maturing ones and much less than in 1933, wilt not being evident in 1934 until the earliest varieties were approaching edible maturity. Excluding the earliest varieties, all the other strains of corn grown in 1934 were grouped into 5 classes for application of Fisher's analysis of variance, the details of which are given.

From the data obtained, the question is raised as to whether there was evidence of true resistance or merely of ability to produce a crop due to tolerance or to escape. The fact that during 1934 very susceptible strains of corn failed to show infection until after July 15 points strongly to the influence of environmental conditions on wilt development in the earliest varieties, which may be regarded as disease escape. Certain midseason and late strains had a high percentage of infection in the leaves and stalks but matured a crop in both seasons, indicating some inherent characters causing disease tolerance. Field observations and statistical analyses indicated that the only strains with significantly lower infections were hybrids having marked vigor, or heterosis, and it would appear that this might possibly explain the resistance of these hybrids. The majority of single-, double-, and top-crossed strains of corn tested exhibited no more resistance than open-pollinated commercial varieties of comparable maturity date, unless heterosis was strongly manifested.

Since the conclusions are based on only 2 yr. of study, they are to be taken as suggestive rather than final. However, for many reasons hybrid varieties apparently will be more popular in the future, but single-, double-, or top-crossed strains of corn will not necessarily be tolerant of wilt merely from the fact that they are hybrids. To secure hybrid vigor it is often necessary to cross inbreds from varieties with marked contrast for several characters. Exchange of inbreds from different regions and testing these lines with local inbreds might hasten the development of early, vigorous, locally adapted, wilt-tolerant hybrids.

Fruit and vegetable losses in market and kitchen caused by plant diseases, P. R. Miller (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1935, Sup. 88, pp. 25, pls. 5*).—This is a preliminary report based on a survey being conducted by the Plant Disease Survey at Knoxville, Tenn. Records were kept of the volume of produce reaching the city and its source, the proportions brought by train and by truck, the methods of distribution from arrival in the city to consumption, the approximate time it remained in the hands of the wholesalers, and how, when, and in what amounts it moved to the jobbers and retailers.

The methods of obtaining data on the losses sustained resolved themselves into the securing of a large group of interested and sincere collaborators among the distributors and consumers, who were willing to keep accurate and complete records of all purchases of fruit and vegetables for a definite period and to call attention to all spoiled produce. As a check on the accuracy, some records were also made directly by the investigators. To facilitate uniformity and accuracy in the data, a systematic method of taking notes was devised, and a composite photograph showing the different types of diseases in fruits and vegetables and charts for the records were furnished to the collaborators. The results of the survey are presented largely in tabular form.

The rust of cherry trees: Leucotelium cerasi n. g. and comb. (Puccinia cerasi) and its aecial stage [trans. title], W. TRANZSCHEL (*Riv. Patol. Veg., 25 (1935), No. 5–6, pp. 177–183*).—*L. cerasi*, new genus and new combination for *P. cerasi*, is reported on sour cherry (*Prunus cerasus*) in Italy and other parts of Europe, and in Italy also on sweet cherry (*P. avium*), peach (*P. persica*), myrobalan plum (*P. cerasifera*), and blackthorn (*P. spinosa*). The new genus *Leucotelium* is placed between the genera *Tranzschelia* and *Ochrospora* of the Pucciniaceae. The spermagonia and aecia occur on *Eranthis hyemalis*. Control consists in eliminating the aecial host.

The control of Dothiorella rot on avocado fruits, W. T. HORNE and D. F. PALMER (*California Sta. Bul. 594 (1935), pp. 16, figs. 3*).—The authors discuss the cause of this avocado fruit rot (*D. gregaria*, with perfect stage *Botryosphaeria ribis chromogena*), the time of development and character, the sources of infection, and the methods of penetration of the fungus, and then detail the results of 4 yr. of experimental work on control measures, from which the following conclusions are drawn:

Dothiorella rot is increased by overhead irrigation, but it can be controlled by fungicides, the liquid forms proving more effective than the dusts. Copper sulfate was more effective than zinc sulfate, and the fungicidal value of the former in bordeaux mixture was greatly increased by the addition of sulfur. Sulfur alone, when applied as a liquid with a spreader, proved very effective. The fungicidal value of zinc sulfate was increased by the addition of a small amount of copper sulfate, and the latter apparently did not interfere with fumigation. Applied alone, zinc sulfate must be used at such strong concentrations as to make it commercially impractical. The most effective spray used was the following: Commercial bordeaux (or 4–4–50 home-made bordeaux) 16 lb., wettable sulfur 6 lb., blood albumin spreader 6 oz., and 100 gal. of water. The next in effectiveness was wettable sulfur alone. Either of these treatments also satisfactorily controlled the avocado red spider.

Since it was found that the fruit is not infected until some time after a diameter of 1.5 in. has been attained, early sprayings are not as important as those made after the fruit is fairly well developed. Furthermore, if the fruit is picked as soon as possible after it has reached a satisfactory oil content infection will be greatly reduced, particularly on unsprayed trees.

Certain aspects of investigations on black-end disease of bananas in Australia, S. HOETTE (*Aust. Council Sci. and Indus. Res. Pam. 58 (1935), pp. 22, figs. 3*).—The different types of black end are defined, and the fungi associated with the conditions are discussed. *Gloeosporium musarum* is shown to be of first importance, and three strains, together with strains of the ascospore stage (*Glomerella cingulata*), are described and their affinities with American and European species pointed out. However, this disease is also caused by *Nigrospora musae*, *Thielaviopsis paradoxa*, and *Fusarium* spp. Inoculation tests with these fungi bore out the conclusions from isolation and observation.

Exposure of plates in the banana ripening rooms indicated that infection does not occur there, and it seems certain that the source of infection must be the plantation.

Beneficial effects on diseased cacao trees of removing infected parts and disinfecting the wounds, L. A. Alicbusan (*Philippine Agr.*, *23* (*1935*), *No. 10*, *pp. 891–903*, *pl. 1*, *figs. 3*).—Diseases constituting one of the prime factors limiting cacao (*Theobroma cacao*) production in the Philippines, the author initiated the present study to determine what are the causes of the death of branches, twigs, pods, and seedlings, and what are the effects of removing the diseased parts and disinfecting the wounds.

Of the diseases, the most injurious on the pods is black rot, on the twigs and branches canker, and on the seedlings blight, all of which are shown to be due to *Phytophthora palmivora* (*P. faberi*). Though often associated with the pod disease, *Diplodia*, *Fusarium*, and *Gloeosporium* proved to be saprophytic on the pods. Infection of the pods by *Phytophthora* occurs either through wounds or direct penetration. Seedlings may be blighted in the absence of injuries, but the twigs and branches are infected only through wounds.

All 78 trees used in the control tests were backyard plantings already in bearing. Trees from which the dead pods had been carefully removed, the affected twigs pruned off, and the wounds treated with bordeaux paste or lead paint appeared more vigorous than those treated with coal tar, formalin or copper sulfate in 5 percent solutions, or sapolin paint. Trees pruned and treated with the bordeaux paste or lead paint and those pruned without the dressing produced new leaves and twigs abundantly, and well-developed fruit setting and large yields followed treatment with the bordeaux paste or lead paint.

Stalk canker of Acanthus mollis [trans. title], G. Lindegg (*Riv. Patol. Veg.*, *25* (*1935*), *No. 5–6*, *pp. 229–235*, *figs. 2*).—The author reports and describes a stalk canker of *A. mollis* due to *Fusoma calidariorum acanthi* n. v., for which a Latin description is given. Control measures are suggested, including a cupric spray.

The perfect stage of Phomopsis stewartii on cosmos, A. L. Harrison (*Mycologia*, *27* (*1935*), *No. 5*, *pp. 521–526*, *figs. 8*).—Working at Cornell University and at the New York State Experiment Station, the author demonstrated by cultural and inoculation studies that the perfect stage of *P. stewartii* is a *Diaporthe*, which he describes and names *D. stewartii*.

Rose blast induced by Phytomonas syringae, H. R. Rosen (*Jour. Agr. Res.* [*U. S.*], *51* (*1935*), *No. 3*, *pp. 235–243*, *figs. 6*).—In this contribution from the Arkansas Experiment Station, the author describes the symptoms, gives the distribution, and details his successful inoculation studies of "rose blast", a disease of roses involving the receptacles, calyx lobes, pedicels, and petioles, and shown to be due to *P. syringae*.

Chestnut blight in California, I–III (*Calif. Dept. Agr. Mo. Bul.*, *24* (*1935*), *No. 4–6*, *pp. 173–191*, *figs. 9*).—Three papers are reported.

I. *Development of the disease*, G. F. Gravatt (pp. 173–177).—The author discusses the history of chestnut blight in the United States, its identification, the age of the tree at which infection occurs, the symptoms, and the spread, sporulation, and virulence of the causal fungus (*Endothia parasitica*).

II. *Procedure in eradication of chestnut blight*, A. E. Mahoney (pp. 178–180).—The discovery in October 1934 of chestnut blight in two plantings in San Joaquin County involved a new disease in California. All trees were carefully examined by a definite procedure, here described, followed by the removal and burning of all that were infected and destruction of all old chestnut wood, prunings, etc., found on the premises. Thus far search has failed to locate the original source of infection.

III. *Statewide survey for chestnut blight*, G. L. Stout (pp. 181–191).—Immediately after the discovery of chestnut blight in California, all county commissioners were asked to locate the trees in their localities preparatory to a tree-by-tree examination by pathologists. This survey was carried on up to December 22, 1934, and involved 521 properties containing 530 plantings and 41,669 trees. The records here compiled represent the findings, and thus far no cases of blight have been located outside of the two plantings originally reported. The methods of the survey and the distribution, ages, and varieties of chestnuts in California are given, and the chestnut industry of the State is evaluated.

Arceuthobium in the United States, L. S. Gill (*Conn. Acad. Arts and Sci. Trans., 32 (1935), pp. 111–245, pls. 11, figs. 12*).—The dwarf mistletoes (*Arceuthobium* spp.) are economically among the most important indigenous parasites in the coniferous forests of the western United States. This monograph, based on field observations and experiments in the United States and with only fragmentary herbarium specimens from other parts of the world available, is offered as a contribution toward an ultimate, orderly, and practical classification of the genus.

The three parts are concerned, respectively, with the characters of the genus as a whole (the shoot, flowers, fruits, seed, and endophytic system, with discussions of the phylogeny and of the general generic and specific characters), the classification of the species (including a key to the species and detailed original and emended descriptions, geographical distribution, hosts, and specific literature references relating to the five United States species and to their forms, and including one form which is described as new and eight which are new combinations), and various pathological considerations (effects on the form of attacked trees, physiological and other biotic relationships, economic importance, and control methods).

A general bibliography covering 17 pages is included.

ECONOMIC ZOOLOGY—ENTOMOLOGY

A manual of land and fresh water vertebrate animals of the United States (exclusive of birds), H. S. Pratt (*Philadelphia: P. Blakiston's Son & Co., 1935, 2. ed.* [*rev.*], *pp. XVII+416, pl. 1, figs. 184*).—This revision of the work previously noted (E. S. R., 51, p. 653) incorporates numerous changes in the nomenclature that have been made and defines more precisely the known ranges of distribution. The sections on amphibians and reptiles are said to have been thoroughly revised by E. R. Dunn.

The significance of food habits research in wild life management, P. L. Errington (*Science, 81 (1935), No. 2103, pp. 378, 379*).—A contribution from the Iowa Experiment Station.

Value of field observation in economic ornithology, W. L. McAtee (*Wilson Bul., 47 (1935), No. 3, pp. 198–204*).—A discussion of the comparative value of field observation and stomach analysis in determining the food habits of birds.

Catalogue of birds of the Americas, VII, VIII, C. E. Hellmayr (*Field Mus. Nat. Hist. [Chicago] Pub., Zool. Ser., 13 (1934), pt. 7, pp. VI+531; 13 (1935), pt. 8, pp. VI+541*).—A continuation of the work previously noted (E. S. R., 62, p. 850).

The birds of Kodiak Island, Alaska, H. Friedmann (*Bul. Chicago Acad. Sci., 5 (1935), No. 3, pp. 13–54, fig. 1*).—Following an introductory account, an annotated list is given of the species of birds occurring on Kodiak Island. A 4-page list of references to the literature on Kodiak Island birds is included.

Birds of the Netherlands, V, E. D. van Oort (*De Vogels van Nederland. 's Gravenhage (The Hague): Martinus Nijhoff, 1935, vol. 5, pp. VIII+325, pls. 80*).—This fifth volume completes the work previously noted (E. S. R., 64, p. 237).

The natural history of the box turtle, H. A. Allard (*Sci. Mo., 41 (1935), No. 4, pp. 325–338, figs. 6*).—The biology, diseases, enemies, etc., of the common box turtle, studied by the author under fairly natural conditions, are presented in popular form.

A co-operative study in earthworm control in Rhode Island, U. S. A., H. F. A. North (*Jour. Bd. Greenkeeping Res. [England], 4 (1935), No. 13, pp. 101–103*).—A report of control work with earthworms at the Rhode Island Experiment Station on plats with worm casts visible through the turf. Applications of arsenate of lead, bichloride of mercury, mowrah meal, G. & O. Worm Eradicator, and tobacco fertilizer were made in June 1932. Counts of the casts were made prior to the applications in June and in August and October and again in May 1933.

Analysis of the October counts showed that control with arsenate of lead at all rates was higher by a safe margin than all other treatments. The counts in May 1933 did not add much to the data of 1932 but showed continued good control for arsenate of lead. The results as reported in two tables, which show that the application of 10 lb. of arsenate of lead (dry) to an area of 1,000 sq. ft. gave 94, 97, and 96 percent control, respectively, led to the conclusion that arsenate of lead is the most effective worm remedy available for general use on fairways.

Two new lungworms, Protostrongylus coburni n. sp. and Pneumostrongylus alpenae n. sp., from the deer Odocoileus virginianus in Michigan, G. Dikmans (*Amer. Micros. Soc. Trans., 54 (1935), No. 2, pp. 138–144, figs. 15*).—Descriptions are given of *P. coburni* n. sp. and *P. alpenae* n. sp., both taken from the lungs of deer (*O. virginianus*) in Michigan.

Studies on the morphology of the common fox lungworm, Capillaria aërophila (Creplin 1839), R. O. Christenson (*Amer. Micros. Soc. Trans., 54 (1935), No. 2, pp. 145–154, figs. 4*).—In a study of *C. aerophila* a difference in size was noted for parasites from the trachea and those from the nasal sinuses, although both were sexually mature.

Some helminth parasites from partridges and other English birds, P. A. Clapham (*Jour. Helminthol., 13 (1935), No. 3, pp. 139–148, figs. 2*).—Examinations for helminths were made on 380 English partridges (*Perdix perdix*), 6 red-legged partridges (*Alectoris rufa*), 12 pheasants (*Phasianus colchicus*), 3 quails (*Coturnix coturnix*), and 7 grouse (*Lagopus scoticus*).

From *P. perdix* 6 species of nematodes and 9 cestodes were recovered. Seven of these. *Capillaria retusa* (Raill. 1893), *Davainea proglottina* (Davaine 1860), *Hymenolepis carioca* (Magal. 1898), *H. anatina* (Krabbé 1869), *H. phasianina* (Fuhrm. 1907), *Raillietina echinobothrida* (Mégn. 1880), and *R.* (*Raillietina*) *tetragona* (Molin 1858), are recorded for the first time from this host. From *A. rufa* were obtained 4 species of helminths, none of which had been recorded from it before. They are *Trichostrongylus tenuis* (Mehlis 1846), *Syngamus* *trachea* (Montagu 1811), *Heterakis gallinae* (Gmel. 1790), and *Hymenolepis phasianina*. From *P. colchicus* 3 species were obtained, all nematodes. From *L. scoticus* 2 species of cestodes and 1 nematode were obtained, all of which had been found in these hosts before. A new cestode infestation, *Metroliasthes lucida*, was noted in the quail (*C. coturnix*).

A study of some Strongyloidea and Spiruroidea from French Indo-China and of Thelazia chungkingensis Hsü 1933 from China, H. F. Hsü (*Ztschr. Parasitenk., 7 (1935), No. 5, pp. 579–600, figs. 31; Ger. abs., p. 598*).—The studies reported, together with a review of the literature, a 2-page list of which is included, have led to the erection of the genus *Pulmostrongylus* and the description of 3 new species of strongyloids and 3 spiruroids.

A photographic method of collecting references, T. B. Mitchell (*Jour. Elisha Mitchell Sci. Soc., 49 (1933), No. 1, pp. 182–184*).—A contribution from the North Carolina Experiment Station.

Field book of insects, F. E. Lutz (*New York: G. P. Putnam's Sons, 1935, 3. ed., rewritten, pp. [9]+510, pls. 100, figs. 32*).—A third edition of this handbook (E. S. R., 46, p. 49), rewritten to include much additional material.

[Contributions on economic insects, insecticides, and insect control] (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., 1935, E–352, pp. 10; E–353, pp. 15; E–354, pp. 58; E–355, pp. 2, figs. 2; E–356, pp. 10, figs. 6; E–357, pp. 4; E–358, pp. 114; E–359, pp. 5, fig. 1*).—These further contributions (E. S. R., 73, pp. 503, 647) consist, respectively, of a Bibliography of the Effect of Light on Insects, compiled by I. L. Hawes; Dried Fruit Fumigation, by P. Simmons, D. F. Barnes, C. K. Fisher, H. C. Donohoe, and C. D. Fisher; A Bibliography of Cyanide Compounds Used as Insecticides, 1930, by H. L. Cupples; A New Curculio Jarring Sheet, by O. I. Snapp and J. R. Thomson; Screw Worm Control, by W. E. Dove; Stimulation of Healing in Non-healing Wounds by Allantoin Occurring in Maggot Secretions and of Wide Biological Distribution, by W. Robinson; A Contribution to a Bibliography of the Described Immature Stages of North American Coleoptera, by J. S. Wade; and The Oblong Weevil (*Phyllobius oblongus* L.), a New Introduced Pest of Trees, prepared by M. W. Blackman et al.

The study of maggot secretions continued earlier work (E. S. R., 73, p. 503). It was found by Robinson that allantoin, a constituent of the urinary secretions of surgical maggots and of common occurrence in plants and animals, stimulates healing, with abundant growth of healthy granulation tissue in slowly healing suppurative wounds. The excretion of this substance into the wound is considered to be one of the factors contributing to the remarkable healing effects obtained in maggot therapy, but the claim is not made that it can be substituted for maggots. Allantoin can be obtained commercially. It is bland, stable, and harmless; it has no odor and is nonstaining. The treatment is simple, painless, and inexpensive.

[Notes on economic insects and their control] (*Jour. Econ. Ent., 28 (1935), No. 5, pp. 833–837*).—The notes here contributed (E. S. R., 73, p. 808) are as follows: Corn Earworm Fails to Overwinter at Ames, Iowa, by R. E. Hutchins (p. 833); Evidence of the European Elm Bark-Beetle [*Scolytus multistriatus* Marsh.] Found in Western Massachusetts, by W. B. Becker (p. 833); *Calomycterus setarius* Roelffs in Maryland, by E. N. Cory (pp. 833, 834); Lights for Light Traps, by E. P. Felt (p. 834); Mosquitoes [*Aedes dorsalis* Coq., *A. idahoensis* Theob., and *A. inornatus* Will.] Annoy Sheep, by G. F. Knowlton and D. E. Madsen (pp. 834, 835), contributed from the Utah Experiment Station; Insects Infesting Cottonseed Meal, by T. L. Bissell (p. 835), contributed from the Georgia Experiment Station; The Screw Worm *Cochliomyia americana* C. & P. Failed to Survive the Winter of 1934–35 in Iowa, by H. D. Tate (pp. 835, 837), contributed from the Iowa Experiment Station; and Notes on Insects Pollinating Onions, by F. R. Shaw, A. I. Bourne, and C. L. Lothrop (pp. 836, 837), contributed from the Massachusetts Experiment Station.

Common insect pests of New York, P. J. Parrott et al. (*New York State Sta. Circs. 159–162 (1935), pp. 4 each, fig. 1 each*).—Practical accounts are given of The Striped Cucumber Beetle, by H. C. Huckett and G. E. R. Hervey; The Mexican Bean Beetle, by H. C. Huckett; The Apple Maggot, by P. J. Chapman; and The Cabbage Worm, by G. E. R. Hervey, H. C. Huckett, and H. Glasgow.

Champlain Valley has own insect problems, O. H. Hammer (*Farm Res. [New York State Sta.], 2 (1935), No. 1, p. 12*).—Reference is made to the importance of the apple maggot, for which properly timed applications of arsenical sprays and dusts have been found to give efficient control, as reported in Bulletin 644 (E. S. R., 71, p. 675), and to the two species of curculio pests of apple which have become major pests and difficult to control in the fruit district of Clinton and Essex Counties lying between Lake Champlain and the foothills of the Adirondack Mountains. Of these, the plum curculio is the more common form and occurs throughout the State, while in New York the apple curculio is confined at present to the Champlain Valley.

[Contributions on economic insects and insect control in Ohio] (*Ohio State Hort. Soc. Proc., 68 (1935), pp. 15–46, fig. 1*).—The contributions presented at the annual meeting of the Ohio State Horticultural Society held at Columbus from January 28 to February 1, 1935 (E. S. R., 73, p. 512), include the following: Recent Studies Showing the Importance of Strong Colonies of Bees for Orchard Pollination, by W. E. Dunham (pp. 15–18); Home Manufacture of Liquid Lime-Sulphur, by F. H. Ballou (pp. 19–28), contributed from the Ohio Experiment Station; Growers' Experiences with Codling Moth Control, by H. F. Heider (pp. 28–30), by H. N. Scarff (pp. 31–33), and by F. Farnsworth (pp. 34, 35); Research Work with Codling Moth, by C. R. Cutright (pp. 35–41), contributed from the Ohio Experiment Station; and The Status of Codling Moth Control in View of Recent Developments and Restrictions, by T. H. Parks (pp. 41–46).

[Contributions on economic insects and insect control] (*Northwest Assoc. Hort., Ent., and Plant Path., Kelowna, B. C., 1 (1935), Abs. Papers, pp. 2–4*).—Abstracts of contributions presented at a conference of the Northwest Association of Horticulturists, Entomologists, and Plant Pathologists, held at Kelowna, B. C., in July 1935, relating to economic insects and their control include the following: The Successful Application of a Canker Paint for Woolly [Apple] Aphis and Canker Control in the Okanagan Valley, by A. A. Dennys, Jr. (p. 2); Notes on the Control of the Blister Mite of Apple, by E. P. Venables, Jr. (pp. 2, 3); The Orange Tortrix as a Greenhouse Pest, by W. Downes (p. 3); and On Field Methods for the Investigation of Codling Moth Insecticides (pp. 3, 4) and The Experimental Application of Calcium Arsenate for Codling Moth Control in an Arid Region (p. 4), both by J. Marshall, and The Codling Moth and the Weather, by R. L. Webster (p. 4), all contributed from the Washington Experiment Station.

[Report of work with economic insects and their control in Puerto Rico], G. N. Wolcott (*Puerto Rico Col. Sta. Rpt. 1934, pp. 142–144*).—The progress of work with economic insects and their control in Puerto Rico, particularly the banana root borer, the pink bollworm, the cottony-cushion scale, the sugarcane root borer *Diaprepes abbreviatus* L., and the lima bean pod borer, is briefly reported upon (E. S. R., 72, p. 216).

The report of the chief entomologist for the year ending 31st December 1934, R. W. Jack (*Rhodesia Agr. Jour., 32 (1935), No. 8, pp. 558–581, pl. 1*).—

An account of the occurrence of and control work with insect pests during the year.

[Work with economic insects] (*Tanganyika Dept. Agr. Ann. Rpt., 1934, pp. 73–89*).—The occurrence of and work with insects affecting coffee, coffee shade insects, coffee spraying, sisal insects, and miscellaneous pests are reported upon by the entomologist, A. H. Ritchie (pp. 73–83). An account by the assistant entomologist, W. V. Harris, dealing with coconut, cotton, native crop, and miscellaneous insect pests, locusts, and apiculture, follows (pp. 84–89).

A preliminary study of the insect pests of cotton in the Philippines, with suggestions for their control, F. Q. OTANES and F. L. BUTAC (*Philippine Jour. Sci., 56 (1935), No. 2, pp. 147–174, pls. 10*).—The insect enemies of cotton given particular attention in this preliminary account are the Malayan cotton boll-weevil *Amorphoidea lata* Motsch, the cotton semilooper or "abutilon moth" *Cosmophila erosa* Hbn., the cotton pyralid leaf roller *Sylepta derogata* Fab., a tortricid leaf roller (*Homona* sp.), the pink bollworm, the bollworm, a caterpillar (*Earias* sp.), the cotton leaf miner *Lithocolletis triarcha* (Meyr.), a cotton stem weevil thought to belong to the genus *Phylaitis*, the common mealybug *Ferrisia virgata* Ckll., the melon aphid, the leaf hopper *Empoasca flavescens* Fab., cotton stainers (*Dysdercus* spp.), thrips (*Thrips* spp.), a red spider (*Tetranychus* sp.), a white fly (*Bemesia* sp.), etc. A list is given of 26 references to the literature.

Two interesting pests of sugar cane in Guatemala, Podischnus agenor Burmeister and Scaptocoris talpa Champion, F. A. BIANCHI (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 39 (1935), No. 3, pp. 191–197, figs. 12*).—Observations of sugarcane pests made in Escuintla, Guatemala, while engaged in the introduction of parasites of the Asiatic beetle into Hawaii are reported. Two considered of potential importance, namely, the scarab beetle *P. agenor* and the heteropteran *S. talpa*, are reported upon.

P. agenor is not known to be of economic importance in Guatemala, having shown a decided preference for uncultivated areas. The boring of both male and female beetles into cane stalks for the purpose of feeding results in a hole about an inch in diameter. Although not more than two internodes are usually detroyed, the damage is probably sufficient to render useless the distal portion of the stalk and to prevent its further growth.

S. talpa, although found on two or three different occasions and in more than one locality in the vicinity of the town of Escuintla, was generally scarce and abounded only in two small areas. These insects could be found in all stages of development except the egg in numbers ranging from a dozen to more than 200 per stool, and were often observed with their proboscises actually stuck into the rootlets of the cane. This feeding weakened and stunted the cane beyond recovery.

The annual wheat field survey, J. S. HOUSER (*Ohio Sta. Bimo. Bul. 176 (1935), pp. 167–171, figs. 3*).—In the eighteenth annual wheat field survey of Ohio (E. S. R., 72, p. 218) made cooperatively by the station, the State department of agriculture, and the State university, 34 counties were visited, 10 wheat fields being examined in each county and a critical analysis of the growing crop of each field made for the presence of wheat-attacking pests.

An alarming increase was found in hessian fly abundance, which was general throughout the State. The average infestation of all the fields examined was 29.3 percent, compared with 15.5 percent in 1934 and 8.1 percent in 1933. A map is given indicating the percentage of wheat straws infested with the hessian fly on the farms visited in the 1935 survey, and also one indicating the hessian fly-free seeding dates.

The infestation of the black wheat stem sawfly *Trachelus tabidus* (Fab.), discovered in the eastern part of the State in 1934 (E. S. R., 72, p. 233), was found to average 37.4 percent in the 92 fields in the occupied area. One field was found to have an infestation of 72 percent of the straws, as compared with 68 percent in 1934. The range of infestation of the State was not far beyond that of 1934, there being some spread in all directions. A map is given showing the area known to be infested by this sawfly, with figures indicating the infestation of all the fields examined in each county. It is pointed out that while repressive measures cannot be suggested at present, two practices may be followed by which the losses caused may be somewhat minimized: (1) Much of the fallen grain may be recovered by the use of the hayrake, and (2) in areas known to be infested the grain should be cut as early as possible because serious lodging is not likely to occur until the wheat is dead ripe.

Neither of the two kinds of jointworms known to occur in the State was found in abundance, the so-called "sheath worm" being detected in only one county and the wheat jointworm in four others.

Chinch bugs were found in half the counties surveyed, but in three counties only were any fields found in which they were abundant.

Lime-sulfur sprays for the combined control of purple scale and rust mites, W. L. Thompson (*Florida Sta. Bul. 282* (*1935*), *pp. 38*).—In experiments conducted in 1932–34, the details of which are given in 14 tables, "purple scale infestations were held in check or reduced by three lime-sulfur sprays following a bordeaux mixture spray. Rust mites were controlled from the time of application to December 1 with less than 2 percent russets and golden fruit. Two lime-sulfur applications at an interval of 2 weeks gave results comparable with one oil emulsion application in control of purple scale when applied after bordeaux mixture. Experimental results of 1 yr. showed that a greater reduction of purple scale was obtained when lime-sulfur or oil emulsion followed basic copper sulfate spray than when it followed bordeaux mixture. The percentage of increase of purple scale was greater following an application of bordeaux 3–3–50 than when following bordeaux 1.5–1.5–50. The effectiveness of liquid lime-sulfur and dry lime-sulfur against purple scale and rust mite was increased by the addition of either wettable sulfur or bentonite sulfur. A greater reduction in numbers of purple scale was obtained when the first lime-sulfur application was made during the first half of April rather than the first half of May."

The control of purple scale and rust mites with lime-sulphur solution, W. L. Thompson (*Citrus Indus.*, *16* (*1935*), *Nos. 7*, *pp. 6*, *7*, *22*, *23*, *26*; *8*, *p. 21*).—A practical contribution contributed from the Florida Experiment Station, based upon the work above noted.

Pine cone and seed pests occurring in the district of Leningrad [trans. title], V. M. Berezina (*Inst. Zashch. Rast.*, *Trudy Zashch. Rast.* (*Lenin Acad. Agr. Sci. U. S. S. R.*, *Inst. Plant Protect.*, *Bul. Plant Protect.*), *Ent.*, *No. 7* (*1935*), *pp. 7–24*, *pl. 1*, *figs. 4*; *Eng. abs.*, *pp. 20*, *21*).—This contribution reports upon *Pissodes validirostris* Gyll., which attacks pine cones of the preceding year, and refers to other forms with which it is associated. Reference is also made to indirect pests of pine cones, and to *Ernobius abietis* L., *Perrisia strobi* Winn., and *Megastigmus abietis* Seitn., associated with spruce cones.

Lepidoptera injuring pine and spruce cones in the forests of the district of Leningrad [trans. title], A. I. Kurentsov (A. J. Kurentzov) (*Inst. Zashch. Rast.*, *Trudy Zashch. Rast.* (*Lenin Acad. Agr. Sci. U. S. S. R.*, *Inst. Plant Protect.*, *Bul. Plant Protect.*), *Ent.*, *No. 7* (*1935*), *pp. 25–47*, *pl. 1*, *figs. 2*; *Eng. abs.*, *pp. 44–46*).—The Lepidoptera here mentioned include *Laspeyresia strobilella* L., *Hyphantidium terebrellum* Zk., *Dioryctria abietella* Schif., *Eupithecia abietaria* Goez and *E. strobilata* Hb., *Evetria margoratana* H. Sch., and *E. resinella* L.

Insecticides and fungicides, R. C. Roark (*Indus. and Engin. Chem.*, *27* (*1935*), *No. 5, pp. 530–532, fig. 1*).—A general discussion, largely of insecticides, in which attention is called to the economic importance, early use, future trends, insecticides derived from plants, synthetic organic insecticides, need for pharmacological research, and fungicides.

Studies of contact insecticides, IX, X (*New Hampshire Sta. Tech. Buls. 62* (*1935*), *pp. 8; 63, pp. 8*).—Two further contributions (E. S. R., 72, p. 504) are presented.

IX. *Further determinations of oil penetration into insect eggs*, W. C. O'Kane and W. C. Baker.—All treated eggs, representing six orders of insects, including the snowy tree cricket, the Mexican bean beetle, the squash bug, the pine leaf aphid *Dilachnus pini* L., the lacewing *Chrysopa oculata* Say, and the cecropia moth, showed traces of oil in the chorion and in tissues surrounding the globular contents or the developing embryo within the egg.

The eggs were immersed in oil for 96 hr., washed in an oil solvent for 10 sec., fixed, washed, and sectioned by the freshening method. The stains used were (1) osmic acid-oil red O, (2) the Rohrbaugh stain of nile blue sulfate-oil red O, and (3) osmic acid-nile blue sulfate-oil red O. Also, eggs were treated with a solution of oil red O in petroleum and were then sectioned.

X. *Penetration of arsenic into insects*, W. C. O'Kane and L. C. Glover.—In a study of the penetration of arsenic through the integument of the American cockroach and the distribution of the poison in various tissues and organs, the distribution of the arsenic within the insect's body was traced by qualitative methods with such quantitative indications as the technic permitted. In the work either dry powdered arsenic, As_2O_3, or dry powdered sodium arsenite was confined in a small beeswax cell on the dorsal surface of the metathorax.

That arsenic passed through the integument was clearly demonstrated, but the manner in which this took place is not known. The surface of a roach was found covered with a liquid, being most noticeable under the wings and more abundant on males. Unpublished data at the station are said to show that common wetting agents exhibit a much lower angle of contact on the male than on the female German cockroach. "No caustic effects on the surface at the point of application of the arsenic were noted. Roaches that died with the cell still attached began to disintegrate first in the thorax and showed a characteristic red color in the decaying tissue in that region. In no case was marked paralysis noted. The roaches usually moved about freely at first, later becoming quiescent. Even in the quiescent state the roach could move its appendages. Control roaches carrying an empty cell were apparently normal after 2 weeks."

A list is given of 23 references to the literature.

An investigation of solvents for the removal of insecticidal fluorine residues from fruits, R. H. Carter (*Jour. Econ. Ent.*, *28* (*1935*), *No. 5, pp. 829–831*).—In a study of the influence of various materials on the solubility of cryolite at 20° C. (68° F.) in water and in dilute hydrochloric and sulfuric acids, the details of which are presented in tabular form, some compounds, notably sodium salts, when added to water and to aqueous solutions of mineral acids decreased the solubility of cryolite, whereas some other compounds, such as boric acid and aluminum and ferric salts, increased its solubility.

Effects of fumigants on paper, C. G. Weber, M. B. Shaw, and E. A. Back (*Jour. Res. Natl. Bur. Standards* [*U. S.*], *15* (*1935*), *No. 3, pp. 271–275, pl. 1*).—The results of tests of the effect of fumigants on the properties of eight different papers are reported in a table which shows the strength, chemical properties, and stability of each paper (1) before fumigation, (2) after fumigating with gas, and (3) after 4.5 mo. of natural aging without fumigating. The fumigants employed were hydrocyanic acid gas, ethylene chloride-carbon tetrachloride, carbon disulfide, ethylene oxide-carbon dioxide, and methyl formate-carbon dioxide. None of these five fumigants had any marked deteriorative effect on any of the representative book and writing papers, although two showed some loss of folding endurance from carbon disulfide.

The results indicate that these five fumigants, all of which are commercially available, can be safely used for ridding valuable documents and books of destructive insects.

The glasshouse symphylid and its control, H. W. Miles and M. Cohen (*Jour. Min. Agr.* [*Gt. Brit.*], *42* (*1935*), *No. 5, pp. 450–457, pls. 4*).—This is a progress report of studies of the garden centipede.

The locust outbreak in Africa and western Asia in 1934, B. P. Uvarov (*London: Econ. Advisory Council, Com. Locust Control, 1935, pp. 65, pls. 11*).—This further report on locust outbreaks (E. S. R., 72, p. 811) deals with the desert locust (*Schistocerca gregaria* (Forsk.)), the tropical migratory locust (*Locusta migratoria migratorioides* (Rch. & Fairm.)), and the red locust (*Nomadacris septemfasciata* (Serv.)). The report is accompanied by an 8-page list of the literature on locusts and grasshoppers and on their control for 1934 and by 11 separate maps showing their distribution, etc.

The prediction and control of outbreaks of Thrips imaginis Bagnall, H. G. Andrewartha (*Jour. Aust. Inst. Agr. Sci., 1* (*1935*), *No. 2, pp. 78–80*).—Observations of the length of developmental stages in days, the length of adult life in days, and the number of eggs deposited per day at temperatures of 9°, 12°, 15°, 20°, and 23° C., respectively, are reported in a table.

Further studies on the effect of controlling the potato leafhopper (Empoasca fabae Harris) in alfalfa by designed cutting, E. M. Searls (*Jour. Econ. Ent., 28* (*1935*), *No. 5, pp. 831–833*).—In continuation of the studies at the Wisconsin Experiment Station (E. S. R., 71, p. 72), data taken from the first cutting of alfalfa plats in 1934 were found to show that where the plats were cut on different cutting schedules in 1933 the control of the potato leaf hopper after cutting, either by spraying or by the cutting itself, exerted a marked influence on the ability of the plants to yield satisfactorily. It was found that compared with the earlier cutting, the deferred cutting was a satisfactory and efficient control of the insect, and that in controlling this pest leaf hopper yellows was eliminated and the yield of alfalfa much increased over the unsprayed plats used in the earlier cutting. Many more weeds were observed in later growths on the early cut, unsprayed areas, showing that plants weakened by insect feeding were not able to compete with the weeds.

The sprayed areas of the early cut plats produced within about 300 lb. per acre as much alfalfa as the unsprayed areas of the deferred cut plats. In the absence of the leaf hopper the alfalfa produced a reasonably satisfactory yield for the first cutting the next year. This experiment would indicate that under field conditions when there is a heavy infestation of the insects, leaf hopper injury may be so severe as seriously to interfere with the ability of the plants to maintain their productivity.

"The sprayed areas in the deferred cutting plats produced only 644 lb. more alfalfa per acre in 1934 than the unsprayed area and contained about 2 percent less weeds. These figures clearly show that deferred cutting had been so efficient in controlling the leaf hopper and reducing leaf hopper damage to the plant in 1933 that the difference in yield of the first cutting in 1934 was not great enough to have justified spraying costs even if spraying were practical on large areas."

The spittle insect or froghopper, B. F. DRIGGERS and B. B. PEPPER (*New Jersey Stas. Bul. 593 (1935), pp. 4*).—A brief account of the history and habits and means of control of froghoppers or spittle insects (Cercopidae) of the genus *Philaenus* (*P. spumarius L.*), which appeared in unusually large numbers in New Jersey in the spring and summer of 1935. Besides occurring in large numbers in their usual habitat in the spring, the insects were reported as doing damage to clover and alfalfa plantings, strawberries, and various flowers and vegetables. In one planting of sweetclover in an apple orchard the authors found from 50 to 75 percent of the plants infested with from 1 to 8 nymphs. In a strawberry planting in Monmouth County, where control experiments were run, 91 percent of the plants were infested.

Tests with nicotine sulfate and soap, used as a spray, and with pyrethrum dust on strawberries failed to control the insect. Derris dusts carrying 0.75 percent of rotenone and applied as a dust gave a satisfactory control of the nymphs on strawberries and sweetclover.

The influence of cane variety on susceptibility to froghopper blight, J. H. TAYLOR and A. PICKLES ([*Imp. Col. Trop. Agr., Trinidad*], *Sugar Cane Invest. Com. Proc., 4 (1934), No. 5, pp. 326–330, pl. 1*).—In work with froghopper blight-resistant varieties, Co 213 was found the most so, being avoided by migrating froghoppers and only rarely blighted.

The woolly elm aphis, E. I. MCDANIEL (*Michigan Sta. Quart. Bul., 18 (1935), No. 1, pp. 9–11, figs. 4*).—A brief practical account of the woolly apple aphid and its control on the elm.

Preliminary report on cotton root aphids in South Carolina, C. F. RAINWATER (*Jour. Econ. Ent., 28 (1935), No. 5, pp. 755–760*).—In work conducted by the U. S. D. A. Bureau of Entomology and Plant Quarantine in cooperation with the South Carolina Experiment Station three species of aphids, namely, the corn root aphid, *Trifidaphis phaseoli*, and *Rhopalosiphum* sp., were found injuring the roots of cotton in the Coastal Plain section of South Carolina in 1934. Notes are given on the distribution, damage, host plants, and biology of these species.

A mealy bug new to Egypt (Pseudococcus brevipes Ckll.) on roots of Phoenix sp. and its control by the application of chemicals to the soil, M. HOSNI and M. SHAFIK (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 159 (1935), pp. 8, pls. 3*).—An account of the pineapple mealybug, first discovered in Egypt in 1932 on the roots of *Phoenix* plants kept in pots in Kobba Gardens, particularly its control, for which all the compounds tested gave promising results. The effect of ortho- and para-dichlorobenzene was quicker than the Seekay and naphthalene. Mercurous chloride showed marked effect on the insect in a short time without injuriously affecting the plants.

An account of the occurrence of Chrysomphalus aurantii Mask. and Laccifer lacca Kerr on grape fruit in Ranchi district, Chota Nagpur, with a note on the chalcidoid parasites of Aspidiotus orientalis Newst., P. M. GLOVER (*Jour. Bombay Nat. Hist. Soc., 38 (1935), No. 1, pp. 151–153, pl. 1*).—The California red scale is said to occur in India, although not a serious pest, on *Agave americana*, *Citrus decumana* (pomelo), *C. aurantium* (orange), *Cycas circinalis*, *C. recurvata*, *Jasminum*, *Morinda tinctoria*, *Morus* sp. (mulberry), *Psidium guajava* (guava), and on rose.

In the Ranchi district the pomelo fruits are commonly found lightly attacked by the California red scale, and the garden rose is occasionally severely attacked. The attack of a pomelo tree by *L. lacca* is referred to.

Lime-sulfur was found to be effective against both coccids but to scorch the foliage severely. A kerosene-soap emulsion consisting of kerosene oil 2 gal., Karunj soap 0.5 lb., and water (soft) 1 gal., diluted with 3 parts of water. was the most effective spray tested.

Brief notes on associated parasites are included.

An account of my studies in the biology of Pieris rapae, III, O. QUERCI (*Ent. Rec. and Jour. Variation, 47 (1935), Nos. 2, p. 14, pl. 1; 4, pp. 47, 48; 5, pp. 60, 61; 6, pp. 73, 74; 7–8, pp. 86, 87*).—This note supplements earlier accounts (E. S. R., 69, p. 690).

The gypsy moth (Porthetria dispar Linn.), W. E. BRITTON (*Connecticut [New Haven] Sta. Bul. 375 (1935), pp. 621–647, figs. 19*).—A revision of Bulletin 186, with much new matter and some portions entirely rewritten (E. S. R., 33, p. 61).

Giant sugar cane moth borer intercepted in Honolulu, C. E. PEMBERTON (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 39 (1935), No. 3, pp. 151–154, fig. 1*).—The emergence of *Castnia licus* Drury from a corm of the ornamental plant *Heliconia angustifolia*, imported from the Panama Canal Zone, which had been fumigated and kept in quarantine in Honolulu, is recorded. Notes on the habits of this pest are included.

Light traps for codling moth control, G. E. MARSHALL and T. E. HIENTON (*Agr. Engin., 16 (1935), No. 9, pp. 365–368, 371, figs. 8*).—Studies conducted at the Indiana Experiment Station are reported in which different electric lamps were employed in connection with the light trapping of codling moths.

The progress results of these experiments indicate that the best position for a light trap is in a tree which carries a full load of fruit, has a fairly broad top, and is located higher than others. The trap should be at least a foot below the topmost foliage.

The results of laboratory tests paralleled those obtained in the field, except in a few instances. In the laboratory when only one light source was used practically all of the moths were attracted, one lamp being as effective as another, whereas in the field the ultraviolet sources attracted more moths than others tested. A photo-flood lamp of high light output proved to be the most attractive lamp tested. It was found that an aluminum painted screen was of little value in making the light sources more attractive, and that the lamps were not attractive enough to entice moths from the orchard 40 ft. away.

Dispersal of the pink bollworm by flight or wind carriage of the moths, R. E. MCDONALD and U. C. LOFTIN (*Jour. Econ. Ent., 28 (1935), No. 5, pp. 745–755, figs. 2*).—Reinfestation following eradication of the pink bollworm by cleaning all the fields and placing the Big Bend area in Brewster and Presidio Counties, Tex., in a noncotton zone for the years 1919 and 1920 led to studies of flight or wind carriage by means of airplane collections, flight screens, and trap plats.

In airplane collections moths were taken at altitudes up to 3,000 ft. above ground level and in large numbers on the flight screens. Some of the trap plats located from 25 to 65 miles from the nearest cotton became infested late in the season in 5 of the 6 yr. planted. It is pointed out that the prevailing wind is from the heavily infested Laguna district of Mexico toward the United States, and that the areas infested in the western part of the United States are in the general direction of the wind currents. The total wind movement in the Laguna district during September 1920 to 1931 was closely correlated with the intensity of the infestation in Texas.

The findings indicate that the pink bollworm moths fly or are carried involuntarily by the wind for considerable distances.

Histological investigations of the metamorphosis of the Mediterranean flour moth [trans. title], W. BLAUSTEIN (*Ztschr. Morph. u. Ökol. Tiere, 30 (1935), No. 3, pp. 333–354, figs. 15*).—This report is accompanied by a list of 13 references to the literature.

Recent experiments in the control of the pecan nut case bearer in the Southeast, G. F. MOZNETTE (*Jour. Econ. Ent., 28 (1935), No. 5, pp. 791–794*).—Control experiments with the pecan nut casebearer in Florida in 1932–34 have shown nicotine sulfate (1–1,000) with summer oil emulsion to be effective. Two applications of summer oil emulsion No. 1, which contained 80.1 percent total oil by weight and the extracted oil had a viscosity of 63 Saybolt sec. and an unsulfonated residue of 92.8 when applied in combination with nicotine sulfate gave a control of 97 percent. In a second plat which received two applications of summer oil emulsion No. 1 only, there was a control of but 42.8 percent. A single application of summer oil emulsion No. 2, which contained 84.2 percent total oil by weight and the extracted oil had a viscosity of 61 Saybolt sec. and an unsulfonated residue of 96.8 percent, when in combination with nicotine sulfate on a third plat gave a control of 93 percent. Two applications of a nicotine-fish oil combination on a fourth plat gave a control of 98.7 percent. A plat which received a nicotine-bordeaux combination spray in the first application and nicotine-oil in the second gave a control of 95.3 percent. The two check plats showed an average infestation of 24.1 percent of the nut clusters, and the average yield for these two plats was about half as great as the yield secured in three of the sprayed plats.

The details of the spraying experiments are reported in tabular form.

[Work with Diatraea spp. and their parasites in Trinidad], A. PICKLES (*[Imp. Col. Trop. Agr., Trinidad], Sugar Cane Invest. Com. Proc., 4 (1934), Nos. 5, pp. 287–289, 306–309; 6, pp. 331–334, 338–340, 346–349, 354–358, 368–373, 380, 383–385*).—The progress of work with *Paratheresia* and *Stomatodexia* parasites of *Diatraea* is reported upon.

Instructions for collecting and forwarding mosquitoes, J. A. SINTON (*[India] Health Bul. 13 (Malaria Bur. No. 5), 2. ed., rev. and enl. (1934), pp. III+II+70, pls. 2*).—Following a brief introduction, the collection and preservation of adult mosquitoes (pp. 6–28) and the collection of developmental stages of mosquitoes (larvae and pupae) (pp. 29–59) are presented, with information on the rearing of mosquitoes from eggs (pp. 60–63). Additional material appears in four appendixes.

Handling mosquitoes on equine encephalomyelitis investigation, G. F. KNOWLTON and J. A. ROWE (*Jour. Econ. Ent., 28 (1935), No. 5, pp. 824–829, fig. 1*).—Contributing from the Utah Experiment Station, the authors report upon methods employed in mosquito transmission studies of equine encephalomyelitis.

Mosquito collections in Florida with the New Jersey light trap, G. H. BRADLEY and T. E. MCNEEL (*Jour. Econ. Ent., 28 (1935), No. 5, pp. 780–786*).—The light trap for mosquitoes developed at the New Jersey Experiment Stations by Headlee (E. S. R., 68, p. 789) was found by the authors to be an efficient collector of mosquitoes for determining their status in Florida.

"An all-night trap collection was found to be a more valuable index of the relative abundance of mosquito species than short collections. Hourly trap collections indicated a considerable mosquito activity throughout the night. *Mansonia perturbans* was most active early in the night, whereas *Anopheles crucians* was most active during the middle of the night. Temperatures of 70° F. or above were most favorable for mosquito activity.

"The seasonal abundance of *M. perturbans* and of *A. crucians* is discussed, and the results obtained by the trap collections are compared with those obtained by other methods. The relative abundance of males and females as found by trap collections is discussed."

Pest mosquito control in Alabama under C. W. A., F. E. Guyton (*Jour. Econ. Ent., 28 (1935), No. 5, pp. 786–790, figs. 2*).—Details of mosquito control work conducted in Alabama from December 5, 1933, to February 15, 1934, as a Federal project in which 819 men were employed and from February 16 to March 29 as a State project are reported.

Ox warble flies, R. S. MacDougall (*Scot. Jour. Agr., 18 (1935), No. 3, pp. 209–218, pls. 2, figs. 3*).—A brief account of the present knowledge of ox warbles (the northern cattle grub and the common cattle grub), particularly the means for their control.

The screw worm outbreak in Florida, W. V. King and G. H. Bradley (*Jour. Econ. Ent., 28 (1935), No. 5, pp. 772–777*).—The results of a survey of infestations in Florida during 1934, the origin of screwworm cases, county relief administration projects, and certain phases of the control problem are considered.

The screw worm situation in Alabama, J. M. Robinson (*Jour. Econ. Ent., 28 (1935), No. 5, pp. 777–779, fig. 1*).—This contribution from the Alabama Experiment Station reports upon the occurrence of and control work with *Cochliomyia americana* C. & P. in the State in 1933 and 1934.

Screw worms in the Southeastern States, W. E. Dove and D. C. Parman (*Jour. Econ. Ent., 28 (1935), No. 5, pp. 765–772, figs. 4*).—This account of the outbreak of *Cochliomyia americana* C. & P., which increased in numbers in the Southeastern States from 1932 to 1934 and caused much loss of livestock, reports briefly upon its biology; recognition, extent, and effect of its attack; predisposing causes; mortality; treatment; and educational work.

Anatomy and postpupal development of the female reproductive system in the apple maggot fly (Rhagoletis pomonella Walsh), R. W. Dean (*New York State Sta. Tech. Bul. 229 (1935), pp. 31, figs. 28*).—In this contribution the female reproductive organs of the apple maggot are described in gross and histological detail, both internal and external parts being considered. The mechanism of the ovipositor is discussed, and data on the postpupal development of the ovaries under field conditions are presented. The account is accompanied by a list of 20 references to the literature.

Sweet potato as food for Drosophila, C. T. Yung (*Natl. Tsing Hua Univ. [Peiping], Sci. Rpts., Ser. B, 1 (1934), No. 6, pp. 217, 218*).—Attention is called to the advantage of using sweetpotatoes as a food medium for pomace fly cultures.

Some observations on the prevention of blow-fly attack in sheep, W. C. Miller (*Scot. Jour. Agr., 18 (1935), No. 3, pp. 226–231, fig. 1*).—A description is given of the methods adopted during recent years at the Institute of Animal Genetics, Edinburgh University, to control loss from attack by maggot fly (*Lucilia* sp. and *Calliphora* sp.) in sheep.

A review of the fleas of North Carolina with special reference to sex ratios, A. D. Shaftesbury (*Jour. Elisha Mitchell Sci. Soc., 49 (1933), No. 1, p. 17*).—The examination of over 2,000 specimens from common animals in 38 counties in North Carolina during the past 2 yr. resulted in the identification of 10 species, a list of which is given.

The life history, economic status, and control of three injurious leaf beetles (Coleoptera: Chrysomelidae), W. E. Hoffmann (*Lingnan Sci. Jour., 14 (1935), No. 3, pp. 505–517, pls. 7*).—The three chrysomelid beetles here considered are the mustard beetle *Phaedon brassicae* Baly 1874, the red and black citrus leaf miner *Throscoryssa citri* Maulik 1928, and an unidentified green citrus flea beetle.

Potato beetle septicemia, G. F. White (*Jour. Agr. Res.* [*U. S.*], *51* (*1935*), *No. 3, pp. 223–234, figs. 2*).—Studies conducted from 1921 to 1929 on a disease of the Colorado potato beetle due to a bacterium previously described as new under the name *Bacillus leptinotarsae* (E. S. R., 61, p. 358), for which the name potato beetle septicemia is suggested, are reported upon. The causative organism, which was found in larvae collected in Washington, D. C., and vicinity, is a short, actively motile, Gram-negative rod. Another bacillus found in cultures from dead larvae of potato beetle septicemia although morphologically and culturally similar to *B. leptinotarsae* is not pathogenic. A nonpathogenic streptococcus also occurs in considerable numbers in some of the larvae sick or dead of the disease. Plate cultures made from feces expressed from healthy potato beetle larvae usually yielded only a small number of colonies. Only a few species occurred, and often these were chromogens. The virulence of cultures of *B. leptinotarsae* on artificial media is said to have changed little in 8 yr. It is considered probable that the disease is a factor in the natural control of the potato beetle.

The diseased larvae are at first sluggish but soon become motionless. Their appetite is impaired, and they soon cease to feed. Usually they fall to the ground when moribund or dead, although dead ones are occasionally found adhering to the food plant. The appearance of sick larvae and of those recently dead is very similar to that of healthy ones. Soon after death the reddish tint of healthy larvae changes to a brownish gray.

The use of carbon disulphide against the Japanese beetle, W. E. Fleming and F. E. Baker (*U. S. Dept. Agr., Tech. Bul. 478* (*1935*), *pp. 92, figs. 40*).—The use of carbon disulfide in combating adult and immature Japanese beetles, based upon experiments conducted from 1920 to 1931, is reported upon, accompanied by a list of 166 references to the literature. It has proved to be one of the most effective fumigants for destroying the different stages of this pest.

"The treatment of soil with carbon disulfide prior to planting appears to have a beneficial effect on the subsequent growth of the plants, but the application of liquid carbon disulfide, or heavy concentrations of the vapor or emulsion, to the plant roots causes severe injury or death. When the concentrations of vapor or emulsions have been carefully controlled, however, successful treatments of soil about the roots of some growing plants have been made without causing serious damage.

"Soil to be used for potting plants can be fumigated with carbon disulfide to destroy the immature stages of the beetle. The use of 1 lb. to a cubic yard of soil has been found necessary to assure the destruction of the insect at a temperature of 45° F. within a period of 48 hr. Ground in the commercial nurseries that is to be used for heeling in plants or plunging potted plants can be freed of infestation by injecting carbon disulfide at the rate of 6 lb. to 100 sq. ft. when the temperature of the soil is above 45° and the soil is in condition to permit the diffusion of the vapor. . . .

"Soil balls about the roots of *Azalea indica* and *Hydrangea opuloides* were fumigated with an insecticidal concentration of carbon disulfide vapor in a closed chamber by inverting the plants and submerging the aerial portions in water during the treatment. Successful insecticidal action is limited to some extent by the moisture content of the soil.

"Several varieties of herbaceous and deciduous plants were treated successfully by submerging the roots in a dip of dilute carbon disulfide emulsion, but the insecticidal concentrations were injurious to evergreens.

"The treatment of potted plants by pouring a dilute emulsion onto the soil was successful in destroying the immature stages of the beetle without damaging the plants, but the procedure was too slow and expensive to be practical in commercial nurseries.

"The application of carbon disulfide emulsion to the soil about the roots of nursery plants in the field has destroyed infestations of the insect without causing serious injury to evergreen and deciduous plants. The various species of ornamental plants that have been successfully treated with emulsified carbon disulfide are listed.

"Blackberries, raspberries, and other fruits have been fumigated with an insecticidal concentration of carbon disulfide vapor without causing damage to the fruit.

"Treatment of infested grasslands with dilute vapor carbon disulfide emulsion controlled the larvae under favorable conditions without causing serious damage to the grass.

"An abstract is given of the approved recommendations on the basis of which nursery stock and crated berries may be certified as free of infestation and be permitted shipment outside of the quarantine zone."

Studies on Neoaplectana glaseri, a nematode parasite of the Japanese beetle (Popillia japonica), R. W. Glaser (*N. J. Dept. Agr. Circ. 211 (1932), pp. 34, figs. 17*).—In experimental infections of healthy Japanese beetle grubs with second-stage nematodes of the species *N. glaseri* (E. S. R., 66, p. 559) a high mortality resulted among the larvae and pupae. The mean number of days from infection to death was 11.3 and the mortality approximately 70 percent. The greater the dosage the less time from infection to death.

"Nemas infect the host by way of the mouth, develop two or three generations within the body, and destroy the grubs by feeding upon the tissues. The development of *Neoaplectana* continues in the grub cadavers until most of the tissues have been consumed. In dying and newly dead individuals all stages of nematode development are found; in cadavers that have been dead longer the second-stage or free-living invasive form dominates.

"Parasitism as demonstrated by *Neoaplectana*, where there is a high mortality of the grubs and a high rate of reproduction of the nemas, is considered unusual.

"The entire life cycle of *Neoaplectana*, corresponding to the life history within the host, has been successfully cultivated upon a special artificial medium which has proved to be differential. A generation develops every 4 or 5 days. After a time, however, the nemas lose their ability to develop upon the artificial medium. This loss is regained by a number of passages through Japanese beetle grubs. Most of the nematode larvae are born while the female is still alive, 15 larvae being the average number born from 1 female. Both sexes are produced in approximately equal numbers.

"Cultivation does not alter the pathogenicity of the nemas for Japanese beetles."

Field experiments with the Japanese beetle and its nematode parasite, R. W. Glaser and C. C. Farrell (*Jour. N. Y. Ent. Soc., 43 (1935), No. 3, pp. 345–371, fig. 1*).—This contribution, with a statistical analysis by J. W. Gowen, reports upon field experiments with *Neoaplectana glaseri* initiated in 1931 on a small scale, as noted above. In introductory work with the nematode the subsurface or burying method yielded significant results. The nematodes became established, produced a high mortality among the Japanese beetle larvae, and spread over the entire experimental area and later to the surrounding field. No pronounced difference was noted in the results obtained between the heavily and lightly inoculated plats.

The Mexican bean beetle and its control, R. Hutson (*Michigan Sta. Quart. Bul., 18 (1935), No. 1, pp. 7–9, fig. 1*).—A brief practical account of the control of this pest, which first appeared in Michigan in 1927.

Further observations on the incidence of parasitism of flea beetles by the nematode Howardula phyllotretae, J. N. Oldham (*Jour. Helminthol., 13 (1935), No. 3, pp. 163–166*).—Records kept on the incidence of infestation, made during a study of the nematode *H. phyllotretae* Oldham 1933 parasitic in flea beetles of the genus *Phyllotreta*, are presented (E. S. R., 69, p. 695). Examination of the data obtained showed that for the years 1932 and 1933 both male and female beetles of all species, namely, *P. atra*, *P. cruciferae*, *P. nigripes*, and *P. undulata*, were parasitized, with the exception of *P. cruciferae* during 1933, in which neither sex was found to harbor parasites.

Calcium arsenate as a control measure for the tobacco flea beetle and hornworm, W. W. Stanley and S. Marcovitch (*Jour. Econ. Ent., 28 (1935), No. 5, pp. 797–801*).—In work at the Tennessee Experiment Station in which insecticides, including lead arsenate, calcium arsenate, natural and synthetic cryolite, barium fluosilicate (Dutox), and paris green, were tested on tobacco, paris green was the only one to result in serious foliage injury.

It is pointed out that the calcium arsenates on the market today represent a vast improvement over those manufactured 15 yr. ago. Tobacco flea beetles were most successfully controlled by Dutox or calcium arsenate. Against the tobacco worm, lead arsenate was slightly better than calcium arsenate. Calcium and lead arsenates and synthetic cryolite when used as sprays gave about the same relative degree of control of the tobacco worm as dusts. Against the tobacco flea beetle, the sprays showed no great difference. Derris and pyrethrum are not satisfactory for control of the worms or the flea beetles. In view of the freedom from foliage injury, the elimination of residual lead, low cost, and high efficiency in the control of both flea beetles and worms, the most satisfactory insecticide for dusting tobacco appears to be calcium arsenate.

Technique for life-history studies of wireworms, M. W. Stone (*Jour. Econ. Ent., 28 (1935), No. 5, pp. 817–824, figs. 2*).—Following a review of the literature, the methods employed by the author in rearing to maturity large numbers of the wireworm *Limonius californicus* Mann. and other species (*Melanotus longulus* (Lec.) and *Aeoleus livens* (Lec.)) destructive to truck crops in southern California are described.

Control of the bean weevil and the cowpea weevil, S. Marcovitch (*Jour. Econ. Ent., 28 (1935), No. 5, pp. 796, 797*).—Observations at the Tennessee Experiment Station have shown that the southern cowpea weevil attacks only cowpeas, and that the bean weevil confines itself to beans. The southern cowpea weevil proved to be much more resistant to the effect of dusts, 50 percent of hydrated lime mixed with cowpeas having given protection while only 2 percent of lime was necessary to protect beans against the bean weevil. With sodium fluosilicate 1 part to 500 parts of cowpeas gave protection, while 1 part to 1,000 parts of beans was sufficient.

Effect of the 1934 drought upon the boll weevil in Oklahoma, F. A. Fenton and E. Hixon (*Jour. Econ. Ent., 28 (1935), No. 5, pp. 760–765*).—The authors have found that the drought of unprecedented proportions which affected Oklahoma during the crop growing season of 1934 effectively checked an early bollweevil infestation, so that practically no damage was done to cotton. "Due to extremely high temperatures the weevil was almost exterminated in fallen squares. It was able to survive, however, in fairly large numbers in cotton bolls which were not affected by the heat. The broods of weevils emerging from bolls in the late summer produced a large supplementary fall generation in late squares which were developed in unusually large numbers by the plants due to heavy rains in September and November. Because of late frosts this large supplementary brood went into hibernation in good condition."

Control of the pecan weevil, H. S. SWINGLE (*Jour. Econ. Ent., 28 (1935), No. 5, pp. 794–796*).—Contributing from the Alabama Experiment Station the author reports that the pecan weevil, which has caused an average loss over a 6-yr. period of approximately 40 percent of the Schley crop in groves in the central part of the State, can be greatly reduced by jarring. In central Alabama jarring, which has been found to be an economical method of control, should commence about August 15 and be repeated at weekly intervals until the first or second week in September.

Nemic parasites and associates of the mountain pine beetle (Dendroctonus monticolae) in Utah, G. THORNE (*Jour. Agr. Res. [U. S.], 51 (1935), No. 2, pp. 131–144, figs. 10*).—A nematode endoparasite, here described as new under the name *Aphelenchulus reversus*, has been found infesting the mountain pine beetle in every locality in Utah and Wyoming investigated, about 2 percent of both adults and grubs of this beetle having been infested with from 1 to 11 female nemas and, in some instances, scores of eggs, larvae, and immature females. Eight ectoparasites and associates new to science are described, namely, *Anguillulina pinophila*, *A. magnicauda*, *Aphelenchoides brachycephalus*, *A. talonus*, *A. tenuidens*, *A. latus*, *Panagrodontus dentatus*, and *Diplogaster pinicola*. New information on *Rhabditis obtusa* Fuchs 1915 is given. Phases of the life histories and habits of these nemas are discussed, and a diagnosis is made of the new genus *Panagrodontus*.

Organization and management of apiaries producing extracted honey in the white clover region, R. S. WASHBURN and G. E. MARVIN (*U. S. Dept. Agr., Tech. Bul. 481 (1935), pp. 44, figs. 9*).—Following a brief introduction, the authors deal with the principal honey plants in the white clover region, apiary organization, man labor used on apiaries of different sizes, practices in the production of honey, cash expenses for apiaries of different sizes, returns for apiaries of different sizes, effect of yield on cost of producing extracted honey, and the individual apiary. The work was carried on in cooperation with the [New York] Cornell, Wisconsin, and Minnesota Universities and Experiment Stations, the Michigan and Iowa State Colleges, and the Ohio State University.

Annual report of the apiculturist, D. RODRÍGUEZ (*Puerto Rico Col. Sta. Rpt. 1934, pp. 170–179*).—This report (E. S. R., 72, p. 216) consists largely of a description of honey plants and their period of bloom and of data on the cost of honey production.

Commerical production of package bees and queens in the United States in 1934, J. M. ROBINSON (*Jour. Econ. Ent., 28 (1935), No. 5, pp. 802, 803*).—This contribution from the Alabama Experiment Station presents a table showing the package bee and queen volume of business, by States, in 1934.

Note on pear midge parasite, L. J. DUMBLETON, (*New Zeal. Jour. Sci. and Technol., 16 (1934), No. 3, pp. 163, 164*).—The progress of work with the parasite *Misocyclops* sp. (not *M. marchali* Kieff.) of the pear leaf-curling midge *Perrisia pyri*, first liberated in a Nelson orchard in 1926 and found in January 1928 to be established (E. S. R., 63, p. 851), is briefly reported upon.

Further note on pear midge parasite, L. J. DUMBLETON (*New Zeal. Jour. Sci. and Technol., 16 (1935), No. 6, pp. 339–341*).—The results of observations of the incidence of parasitism of the pear leaf-curling midge *Perrisia pyri* by *Misocyclops* sp. made during the 1934–35 season are reported in tabular form. This parasite appears to be well established in both the Nelson and Henderson centers, the percentage of parasitism of the second-brood larvae at Henderson being very high.

Some remarks concerning the egg parasite Trichogramma minutum Riley in Florida, C. O. Bare (*Jour. Econ. Ent., 28 (1935), No. 5, pp. 803–815, fig. 1*).—Biological control work with the greenhouse leaf tier which led to the discovery of a new race of the egg parasite *T. minutum* in the Sanford celery district of Florida is reported upon, the details being given in seven tables.

Even when large numbers of this parasite were liberated within small areas there was only a small increase in the percentage of parasitization as compared to that in control areas where no parasites had been liberated. Thickly distributed colonies of overwhelming numbers of parasites placed in celery rows when egg hosts were abundant gave only a moderately high percentage of parasitization.

The work has shown that there are a number of serious difficulties in the way of the practical use of this parasite for the biological control of the greenhouse leaf tier in Florida.

Corn earworm not controlled in sweet corn by release of Trichogramma, W. H. Larrimer (*Jour. Econ. Ent., 28 (1935), No. 5, pp. 815, 816*).—It is concluded from the percentage of parasitization of the corn ear worm by *T. minutum* Riley, the percentage of ear worm infestation, and the ear worm populations in the ears of six plantings (⅕-acre planting each) of Golden Cross sweet corn made at intervals of 2 weeks from May 1 to July 10, which followed the liberation of 30,000 parasites at Arlington, Va., June 5 and 40,000 individuals July 19, that no beneficial effect whatever resulted.

The black widow spider (Latrodectus mactans Fabr.), D. C. Mote and K. Gray (*Oregon Sta. Circ. 112 (1935), pp. 9, figs. 5*).—A brief practical account of this spider.

ANIMAL PRODUCTION

The effect of retarded growth upon the length of life span and upon the ultimate body size, C. M. McCay, M. F. Crowell, and L. A. Maynard (*Jour. Nutr., 10 (1935), No. 1, pp. 63–79, fig. 1*).—This study at the [New York] Cornell Experiment Station was undertaken to determine the effect of retarding growth upon the total length of life and to measure the effects of retarded growth upon the ultimate size of the animal's body. Growth was retarded by limiting the calories, and the rats used as experimental animals were not allowed to attain maturity until after periods of 766 and 911 days.

Even at these extreme ages the body still retained the power to grow, but after these periods of retardation the animal could not attain a body size equal to that of an animal that matured younger. This conclusion was based upon the smaller size of the entire body, the weight of such organs as the heart, and the size of the femurs. After periods of suppressed growth the male rat retained a growth potential greater than the female, although the males of the retarded group grew no larger than normal females. The hearts of the retarded animals dying in old age were larger than normal, while the livers were smaller. The kidneys corresponded in weight at the time of death to the maximum body weight attained. The femurs of retarded animals were less dense than those that matured normally.

In retarded groups both sexes attained extreme ages beyond those of either sex that grew normally. At a constant weight level during retarded growth the females required more calories for maintenance than the males. The diameter of the heart also reflected the retarded growth of the body.

The influence of certain dietary constituents on the response of rats to gossypol ingestion, W. D. Gallup and R. Reder (*Jour. Agr. Res.* [*U. S.*], *51* (*1935*), *No. 3, pp. 259–266*).—Continuing the studies on gossypol (E. S. R., 67, p. 296) at the Oklahoma Experiment Station, rats were fed experimental diets to determine the dietary factors influencing the response to gossypol ingestion. The diets containing a known percentage of gossypol were varied in their content of protein, fat, carbohydrate (lactose), and calcium and in their potential acidity and alkalinity.

Both ad libitum and paired feeding tests with diets of variable protein content (13 to 51 percent) indicated that a high protein intake was favorable to the detoxication of gossypol. High fat diets exerted a questionable effect. At a 20-percent level lactose was detrimental to the growth of normal rats, and its effect on gossypol was slight. Acid diets with a 1.2 percent calcium level were detrimental to the growth of normal rats and only slightly influenced the gossypol rats that survived. Alkaline diets with a 1.2 percent calcium level were superior to all others in allowing the gossypol rats to approximate normal growth. From these results it is concluded that calcium salts in the presence of excess base were favorable to the detoxication of gossypol in the animal organism. Indirect evidence of a chemical reaction between calcium and gossypol is offered in support of this conclusion.

It is recommended that in a biological assay of gossypol a basal diet that is slightly acid and contains only that amount of calcium and protein needed for maintenance and moderate growth be used. When it is desirable to secure rapid growth on diets containing cottonseed products, it is suggested that a reasonable excess of base-forming elements, particularly calcium, and liberal amounts of protein be fed.

The digestible nutrients of Napier grass and Crotalaria intermedia silages, Natal grass hay, and the dried refuses of grapefruit and orange canneries, W. M. Neal, R. B. Becker, and P. T. D. Arnold (*Jour. Agr. Res.* [*U. S.*], *51* (*1935*), *No. 2, pp. 173–176*).—Continuing these investigations (E. S. R., 74, p. 81) at the Florida Experiment Station, a study was made to determine the composition, coefficient of digestibility, and digestible nutrients of silages made from Napier grass (*Pennisetum purpureum*) and *C. intermedia*, of hay from Natal grass (*Tricholaena rosea*), and of dried refuse from grapefruit and orange canneries.

Napier grass silage was low in digestible protein and contained about two-thirds as much total digestible nutrients as corn silage. *C. intermedia* silage was lower in total digestible nutrients but a better source of protein than corn silage. It was felt that if this grass had been cut at an earlier stage of maturity the silage would probably have been more desirable. Natal grass hay was comparable in feeding value to timothy hay. The dried citrus refuse was lower in digestible crude protein but slightly higher in total digestible nutrients than dried beet pulp, with which it compared favorably in feeding value.

The details of the study are given in tabular form.

Effect of the stage of maturity and method of curing upon the vitamin B and vitamin G content of alfalfa, clover, and timothy hays, O. H. Hunt, P. R. Record, and R. M. Bethke (*Jour. Agr. Res.* [*U. S.*], *51* (*1935*), *No. 3, pp. 251–258*).—The Ohio Experiment Station made a study of the vitamin B (B_1) and G (B_2) content of alfalfa, clover, and timothy hays as influenced by the stage of maturity of the plant when cut and by natural climatic factors. Growth studies with chicks were made to show the value of the chick method of assay for the vitamin G complex as compared with the rat method.

These hays contained significantly more vitamin G than vitamin B. Both the vitamin B and G content of the hays decreased as the plant matured and, in general, were correlated with the leafiness, greenness, and protein content of the plant. Exposure of 96 hr. to the weather without rain did not affect the vitamin G content, but 0.68 in. of rain removed as much as 50 percent of this vitamin. Early-cut timothy and clover hay may have as high a vitamin G content as alfalfa cut at a later date and with a much greener color.

The chick method of testing for vitamin G by growth and incidence of leg paralysis compared favorably with the rat assay method. It required 10 percent of an alfalfa meal containing 13 rat units of vitamin G per gram to induce good growth in chicks and to prevent the occurrence of leg paralysis.

Inspection of feeds, W. L. Adams and A. S. Knowles, Jr. (*Rhode Island Sta. Ann. Feed Circ., 1935, pp. 19*).—The guarantees and analyses found for protein and fat of 314 samples of feeding stuffs collected for official inspection in 1934 are reported (E. S. R., 72, p. 89).

[Experiments with livestock in Puerto Rico] (*Puerto Rico Col. Sta. Rpt. 1934, pp. 49, 50, 161–164*).—The results obtained in these studies are reported on a comparison of protein levels for dairy cows, and the utilization of local industrial byproducts as feeds for livestock, by F. Picó. An analysis of grapefruit bran is included.

Beef cattle improvement in Florida.—I, Improvement of beef herds through breeding; II, A method of grading range breeding cows, B. Knapp, Jr., and A. L. Shealy (*Florida Sta. Bul. 281 (1935), pp. 22, figs. 16*).—The first part of this bulletin describes how beef herds may be improved through breeding. The selection of foundation breeding cows and purebred bulls is discussed, and a score card for grading animals is presented.

The second section describes and illustrates the grading of breeding cows. A score card for use in this respect and a discussion of its points are presented.

Appended is a list of 10 points to be observed in the beef cattle improvement program for Florida.

Cattle feeding: Winter steer feeding, 1931–1932, J. H. Skinner and F. G. King (*Indiana Sta. Bul. 396 (1935), pp. 11*).—This study was undertaken to obtain information on the efficiency of certain combinations of feeds available for cattle feeding in Indiana. The work was divided into the following parts: (1) Soybean hay, (2) soybeans and oat straw v. cottonseed meal, silage and clover hay, (3) wheat as a cattle feed, and (4) shock corn v. shelled corn.

It was found that with a basal ration of corn, cottonseed meal, and silage, soybean hay gave approximately the same results as clover hay. The addition of cottonseed meal to a ration of corn, soybean hay, and silage increased the rate but not the efficiency of gains. While cattle fed corn, oat straw, and soybeans gained slower and had less finish than cattle fed corn, cottonseed meal, silage, and clover hay, the net profit was greater for the first ration. Wheat when used as part of the grain ration for fattening cattle proved to be quite satisfactory. The ration of shock corn, corn silage, and cottonseed meal gave practically the same results as when consisting of shelled corn, cottonseed meal, corn silage, and clover hay.

Methods of utilizing the corn crop for fattening steers, G. A. Branaman and R. S. Hudson (*Michigan Sta. Quart. Bul., 18 (1935), No. 1, pp. 57–60*).—Continuing this study (E. S. R., 72, p. 236), it was found that with a basal ration of cottonseed meal and alfalfa hay steers fed cut shock corn made average daily gains of 1.7 lb. per head, those fed silage 1.8, and those fed shock corn 1.6 lb. per head during a 165-day feeding period. The returns per acre of corn as fed were $56.02, $88.78, and $51.15. Due to the higher costs in the preparation of ground shock corn, this method of feeding was the least efficient. It was found that in order to fatten a steer or to produce a similar quantity of beef and pork 50 percent more acreage of corn was required when shock corn was fed than when corn silage was fed.

Further observations on cane molasses as a cattle feed, Labh Singh and S. Gambhir Singh (*Agr. and Livestock in India, 5* (*1935*), *No. 1, pp. 34, 35*).—Continuing this study (E. S. R., 73, p. 369), two lots of six bullocks each were fed as in the previous experiment. On the basis of these experiments it is concluded that feeding cane molasses to animals in amounts up to 2 lb. per head per day during the winter was safe and economical. However, the feeding of cane molasses during the summer months was not a safe practice.

Ancestry and evolution of hogs, E. N. Wentworth (*Amer. Cattle Prod., 17* (*1935*), *No. 2, pp. 3-7, figs. 5*).—In this article the author shows that swine are more like the primitive species than any of the other domesticated animals. The ancestors of the present type of swine are described, but it is pointed out that little is known of the process of domestication. It is shown that domesticated swine trace their descent almost exclusively from *Sus scrofa* and *S. indicus*.

A six years' study of crossbreeding swine, L. M. Winters, O. M. Kiser, P. S. Jordan, and W. H. Peters (*Minnesota Sta. Bul. 320* (*1935*), *pp. 18, figs. 9*).—In this study 49 lots of pigs were used, comprising a total of 1,535 pigs farrowed. Of the total, 1,410 pigs were farrowed alive, 1,134 were carried to weaning, and 848 were finished for market.

It was found that the first cross, the three-breed cross, and the back-cross groups were all superior to the comparable purebreds. The three-breed cross was superior to the other crosses, while the first cross and the back-cross were about equal in their superiority to the purebreds. Crossbred sows were superior to purebreds for producing market pigs, which benefited as much from being out of crossbred sows as they did from being crossbreds themselves.

The crossbred litters averaged from one-third pig to two pigs larger at weaning time, each pig averaged 5 to 7 lb. more at weaning, and the litters weighed from 39 to 96 lb. more than the purebreds. Crossbreds reached a market weight of 220 lb. from 17 to 22 days earlier on 27 to 36 lb. less of grain than comparable purebreds. As a result of this experiment a new method of breeding market pigs, known as crisscrossing, is recommended.

Feeding pigs on forage, W. L. Robison (*Ohio Sta. Bul. 552* (*1935*), *pp. 57, figs. 7*).—A series of investigations was undertaken to determine the value of forage crops for pigs, to compare various forage crops, and to determine methods of feeding on forage.

The worth of pasture for pigs and factors influencing its value.—It was found that pigs on pasture gained about 0.25 lb. more per head daily and were ready for market 24 days earlier than similar pigs in dry lot. Green feed enabled pigs to make more effective use of their grain and kept the animals in a healthy, vigorous condition. A suitable forage crop was found to be palatable and succulent, low in fiber, and high in minerals and protein, and its worth was influenced by ease and cost of seeding, ability to produce new growth, remain green, and withstand grazing, and adaptability to local conditions. Such crops as bluegrass, rye, wheat, and oats in their early development compared favorably with legumes.

Various forage crops compared.—Of the crops tested alfalfa proved to be the most satisfactory. Red clover, when not dry and woody, compared favorably with alfalfa in nutritive value but was not equal to it in carrying capacity or drought resistance. Alsike provided little forage after midsummer and was not equal in value to red clover. Dwarf Essex rape ranked high as an annual forage crop. Mixing other forages with rape decreased its value. Soybean pasture compared favorably with red clover and rape, but because of its shorter season and lower carrying capacity was less valuable than rape. Sudan grass produced an abundance of fairly palatable forage, but its nutritive value was not equal to rape or soybeans. Sweetclover was distasteful to pigs. Spring-sown winter wheat and sweetclover compared favorably with rape, while a mixture of Peruvian alfalfa and spring-seeded winter wheat was practically equal to rape. Bluegrass made good early pasture, but had a relatively low value during the summer.

Protein and mineral supplements to grain for pigs on pasture.—The need for protein supplements on pasture was influenced by size of pigs and proportion of forage to grain consumed. A protein supplement increased the rate of gain regardless of the age of the pig, with the increase being greatest for young pigs. Pigs with no protein supplement ate noticeably larger amounts of forage. Full-fed pigs on pasture required less protein supplement than similar pigs in dry lot. Adding minerals to a ration of corn and salt for full-fed pigs on pasture improved the ration but not to the same extent as did a protein supplement. Where the protein supplement was of plant origin, minerals were beneficial as a supplement to corn. Salt appeared to be the only mineral addition needed in a corn-tankage ration. For pigs under 70 lb. initial weight uncooked soybeans and corn germ meal gave poorer results than other supplements tried. Skim milk, fishmeal, tankage, soybean oil meal, linseed meal, buckwheat middlings, and boiled soybeans were satisfactory supplements for pigs on pasture.

Different amounts of grain or concentrates for pigs on forage.—Pigs on a limited grain ration on pasture gained slower but required less feed per unit of gain than full-fed pigs. Pigs on a limited ration until they reached 125 lb. in weight and then full fed were ready for market 3 weeks later than similar pigs full-fed the entire time. The choice of limited feeding or full feeding should depend upon market conditions and the price of new and old corn.

Finishing feeder shotes.—Pigs that had received a limited ration on pasture gained 15 percent faster and required 11 percent less feed when finished on pasture than when finished in dry lot. There was no advantage in adding tankage to the ration of limited-fed pigs on clover pasture. Full-fed pigs on pasture made more economical gains than limited-fed pigs.

Preparation and method of feeding corn.—Ear corn and shelled corn were practically equal in feeding value, while ground corn was worth 7 percent more for feeding pigs. Ground corn that was moistened and fed as a slop gave no better results than when fed dry. Self-fed pigs were ready for market 10 days earlier than similar pigs hand full-fed twice daily, but self feeding was more expensive and was not adapted to the feeding of ear corn. By mixing ground oats or some other less palatable feed with tankage or other protein supplement it could be self-fed even when the corn was hand-fed twice daily.

The effect of soybeans, soybean oil meal, and tankage on the quality of pork, C. M. Vestal and C. L. Shrewsbury (*Indiana Sta. Bul. 400* (*1935*), *pp. 47, fig. 1*).—A series of tests was undertaken to determine the effect of soybeans and soybean products on the quality of fresh and cured pork. A total of 422 hogs fed experimental rations were used in the meats tests. Three feeding experiments were conducted in dry lot and two on alfalfa pasture. It is pointed out that soybeans should be used as a supplement to corn, and from the standpoint of practical application of this number 14 percent is the maximum quantity of soybeans to be used.

In the feeding work it was found that adding minerals to a corn-soybean ration for growing fattening pigs increased the rate and efficiency of gains. Roasted and cooked soybeans had higher nutritive values than raw soybeans. Roasted beans were superior to tankage for producing gains and superior to tankage and soybean oil meal in reducing feed requirements. Because of their palatability roasted soybeans should not be self-fed free choice. Soybean oil meal and raw soybeans were less efficient than tankage for producing gains.

From a carcass standpoint based on committee grades and refractive index of back fat, soybeans produced a high percentage of soft carcasses when fed to 60-lb. pigs in dry lot. When fed to 75-lb. pigs on pasture and 125-lb. pigs in dry lot, soybeans produced firm carcasses. Feeding tankage or soybean oil meal to 75-lb. pigs on pasture and 60-lb. pigs in dry lot produced firm carcasses. Carcasses from the heavier hogs fed soybeans were not as firm as those from pigs fed tankage or soybean oil meal. Of 268 cured and smoked hams from pigs fed soybeans 7.1 percent were soft, while 4.8 percent of 84 hams from soybean oil meal-fed pigs and 4.3 percent of 69 hams from tankage-fed pigs were soft. Of 267 cured and smoked bacons from hogs fed soybeans, 24.3 percent were soft, and 11.9 percent of 84 bacons from pigs fed soybean oil meal and 18.8 percent of 69 bacons from tankage-fed hogs were soft. There was no significant difference in the shrinkage of hams or bacons during curing and smoking when hogs were fed these supplements.

The antihaemorrhagic vitamin of the chick, H. Dam (*Nature* [*London*], *135* (*1935*), *No. 3417*, *pp. 652, 653*).—Continuing this investigation (E. S. R., 72, p. 520), the author describes how the antihemorrhagic vitamin may be distinguished from vitamins A, D, and E. It has not been possible to demonstrate the need for this vitamin by animals other than the chick. The author suggests the term vitamin K for this antihemorrhagic factor.

Fall and winter feeding and management of pullet layers, D. C. Kennard and V. D. Chamberlin (*Ohio Sta. Bimo. Bul. 176* (*1935*), *pp. 172–176*, *fig. 1*).—In this article the author discusses the transfer of pullets to the laying house and the management, feeding, and use of artificial lights for pullets.

Finish poultry before marketing, W. A. Brown and F. C. Elford (*Canada Dept. Agr. Pam. 162*, *n. ser.* (*1934*), *pp. 14*, *figs. 5*).—In this publication the reasons for finishing poultry, the feeding of different kinds of poultry for market, and the marketing of the finished product are discussed.

An analysis of some egg faults, I, II, E. T. Halnan and H. D. Day (*Jour. Min. Agr.* [*Gt. Brit.*], *42* (*1935*), *Nos. 3*, *pp. 236–245*, *fig. 1*; *4*, *pp. 326–337*).—An analysis of egg faults occurring in 164,831 eggs laid at the West Suffolk egg-laying trials during 1931–34 by the School of Agriculture, Cambridge, showed that the most common faults were meat spots, large air space, watery whites, deformed shell, and dropped yolks.

During the period 1933–34 the percentage of faults was 3.2 in eggs produced in the trial as compared with 6.2 percent for eggs received from general poultry keepers. The designation of faults varied with different candlers, indicating a need for standardization in this respect. Evidence is presented to prove that it is unsound to regard eggs characterized by rapid rotating yolk movement as faulty. During the summer months the faults in eggs tended to increase. There was no correlation between the productivity of the bird and egg faults. Conditions of feeding and management appeared to be a secondary cause in the production of faults. The occurrence of a particular type of fault appeared to be definitely linked with the individual bird rather than with external conditions. Bloody eggs, blood spots, and meat spots appeared to be associated faults, as do large air space and weak and deformed shells.

On the basis of the above results it is concluded that the quickest method for eliminating faults is the intelligent use of the candling lamp, followed by rejection as breeding stock of all birds proved to lay faulty eggs.

The influence of chronic fluorine toxicosis in laying hens upon the fluorine content of the egg and its relation to the lipoid content of the egg yolk, P. H. PHILLIPS, J. G. HALPIN, and E. B. HART (*Jour. Nutr., 10 (1935), No. 1, pp. 93–98*).—Continuing these studies (E. S. R., 73, p. 95) at the Wisconsin Experiment Station, five lots of laying birds were fed the same basal ration. The control group received no mineral supplement, but lot 2 received 95 parts of the basal ration with 2 parts of ground limestone and 3 parts of steamed bone meal added. In lots 3, 4, and 5 the ration was identical with lot 2 except that 1, 2, and 3 percent of raw rock phosphate, respectively, was substituted for the steamed bone meal. The calcium-phosphorus ratio in all lots except the control was approximately 2:1.

In the form used the addition of fluorine resulted in a distinct and measurable increase in the fluorine content of the eggs. The fluorine accompanied the constituents of the egg yolk. It could be completely separated from the nonfat portion of the yolk by examination of the fatty constituents with ether or ethyl alcohol. It appeared that at least a large part of the fluorine remained with the acetone-insoluble portion of the fatlike substance of the egg yolk. This suggests that fluorine was deposited in the egg in combination with the complex lipoids of the yolk.

Fluorine appeared to be present in minute quantities in the normal egg. Increased fluorine ingestion did not reduce the size of the eggs. The authors discuss the possible harmful effects that may occur with eggs from fluorine-fed hens.

DAIRY FARMING—DAIRYING

Things dairy scientists are thinking about, J. C. HENING (*Farm Res. [New York State Sta.], 2 (1935), No. 1, pp. 10, 11*).—In this paper the author summarizes some of the results of investigations reported at the meeting of the American Dairy Science Association held at the University of Minnesota in June 1935.

The goat industry in Canada, A. A. MACMILLAN (*Canada Dept. Agr. Bul. 177 (1935), pp. 16, figs. 10*).—The breeds of milk goats are described, and the feeding, management, and breeding of goats are discussed.

Lability of the basal metabolism of the dairy cow, F. G. BENEDICT and E. G. RITZMAN (*Natl. Acad. Sci. Proc., 21 (1935), No. 6, pp. 304–308; also New Hampshire Sta. Sci. Contrib. 48 (1935), pp. 304–308*).—Investigations conducted in cooperation with the Nutrition Laboratory of the Carnegie Institution of Washington brought out the fact that the basal metabolism of the dairy cow is by no means constant, even for a relatively short time, and that it is extremely difficult to give one representative basal value for dairy cows in general. On the basis of these studies it was felt that for a series of feeding experiments carried on throughout the winter one basal value determined either at the beginning or the end of the series would not be applicable to the various feed measurements. A less marked lability in metabolism was also noted with the sheep and the horse. These observations have an economic value in assisting the nutritive values of the different feeds and emphasize the possibility of a tremendous variability in the endogenous metabolism of any adult organism, even when there was no appreciable change in body weight.

Studies on the chemical composition of the blood of dairy cattle.—I, The effect of age and phosphorus intake on the calcium and inorganic phosphorus content of whole blood of dairy heifers, A. H. VAN LANDINGHAM,

H. O. HENDERSON, and G. A. BOWLING (*Jour. Dairy Sci., 18 (1935), No. 8, pp. 557–572, figs. 2*).—The West Virginia Experiment Station made a study of the effect of age and level of phosphorus intake on the calcium and inorganic phosphorus content of the blood of dairy heifers during the periods of growth, gestation, and first lactation. Feeding was so controlled that all animals received approximately the same amount of digestible crude protein and total digestible nutrients in proportion to body weight.

When animals were fed a normal phosphorus ration the inorganic phosphorus of the blood showed a slight increase from the second to the fourth month, after which it remained fairly constant to the tenth month and then gradually declined as the animals grew older. The concentration of inorganic phosphorus in the blood was a good index of the severity of phosphorus deficiency in the ration. There was always an immediate lowering of the inorganic phosphorus in the blood on low phosphorus rations, and the rate of lowering was roughly proportional to the degree of deficiency. Loss of appetite, stiffness in front and rear quarters, and general emaciation were physical symptoms of phosphorus deficiency.

The phosphorus requirement of growing dairy animals was not directly proportional to gain in body weight, but depended to a considerable degree upon the rate of skeletal growth. There was a decrease in requirement for growth in proportion to body weight with increase in age as the animals approached maturity. An average daily intake of approximately 25 g appeared to be sufficient to maintain a normal supply of inorganic phosphorus in the blood up to 25 mo. of age, but an average intake of 8 g was not sufficient. Age and level of phosphorus intake were without effect upon the calcium content of the whole blood of the animals.

The mineral requirements of milk production: The annual cycle of mineral and nitrogen metabolism of the milch cow as affected by alfalfa hay, timothy hay, bone flour, and ground limestone, E. B. FORBES ET AL. (*Pennsylvania Sta. Bul. 319 (1935), pp. 152, figs. 52*).—This investigation was undertaken to determine the mineral and nitrogen balances of producing dairy cows throughout the annual cycle of lactation and gestation as affected by alfalfa compared with timothy hay and by bone flour or ground limestone added to rations containing alfalfa or timothy hay. The study also included an investigation of the mineral requirements of milk production, the interrelationships between the mineral elements in nutrition, and the general performance and condition of dairy cows in relation to the mineral nutriments of the ration. A total of 12 cows was fed in a continuous series of 28-day balance studies of the metabolism of sodium, potassium, calcium, magnesium, phosphorus, chlorine, and nitrogen in certain rations with and without mineral supplements for approximately 1 yr. Of the rations used, six were composed of alfalfa and six of timothy hay with a concentrate mixture and corn silage. Two rations in each group were supplemented with bone meal, two with ground limestone, and two were unsupplemented. The experiment started immediately after the cows had calved, and at the end of the experiment six cows were with calf, one had aborted, two had calved normally, and three were farrow. Most of the cows were in milk for more than 300 days. Bone meal was fed in amounts equal to 2 percent of the concentrate mixture, and ground limestone was fed in amounts to provide the same weight of calcium.

The results showed that salt fed at the rate of 1.5 percent of the concentrate mixture provided liberally for the sodium and chlorine requirements. Calcium, magnesium, potassium, phosphorus, and nitrogen were present in all rations in quantities sufficient for lactation and reproduction. While bone meal and ground limestone were assimilated to a certain extent, these supplements were not needed by the moderately high-producing cows in this study. The unsupplemented alfalfa hay ration contained from 0.795 to 0.828 percent of calcium and 0.279 to 0.299 percent of phosphorus, while the unsupplemented timothy hay ration contained 0.33 percent of calcium and from 0.306 to 0.312 percent of phosphorus on a dry-matter basis.

The best cow on the unsupplemented alfalfa ration produced 14,894 lb. of milk, and the best cow on the unsupplemented timothy ration 11,989 lb. of milk during 317 and 327 days of lactation, respectively. This difference was due to the individuality of the animals. It is concluded that cattle may need mineral supplements, especially bone meal, when the ration is abnormally low in calcium or phosphorus, or when the animals receive little roughage. On this basis these mineral products should not be included as regular components of commercial mixed feeds, and when they are needed may be fed by mixing with one-fourth as much common salt and allowing the cattle free access to the mixture. In this study the recovery of feed energy in the form of milk by the cows on experiment for a full year was 21 percent during the lactation period and 18.7 percent for the calendar year.

The detailed results of this experiment are given in extensive tables and graphs.

Vitamin A content of pasture plants.—II, Timothy (Phleum pratense L.) and red top (Agrostis alba L.) under pasture conditions and fed green, E. Woods, F. W. Atkeson, H. Wellhousen, and R. F. Johnson (*Jour. Dairy Sci., 18 (1935), No. 8, pp. 547–556, fig. 1*).—Continuing this investigation (E. S. R., 69, p. 412), the Idaho Experiment Station found that timothy and redtop contained 220±13 and 308±10 rat units, respectively, considering a gain of 12 g in 4 weeks as representing 1 unit. This was a statistically significant difference. In respect to vitamin A content, timothy ranks between white clover and Kentucky bluegrass, while redtop contained one-third more units than white clover.

Vitamin D studies in cattle.—I, The antirachitic value of hay in the ration of dairy cattle, C. F. Huffman and C. W. Duncan (*Jour. Dairy Sci., 18 (1935), No. 8, pp. 511–526*).—The Michigan Experiment Station undertook an investigation to determine the vitamin D requirements of calves and to study the antirachitic potency of hay. Anorexia, usually associated with rickets in calves, was responsible for the poor hay consumption in this work. The curative method was difficult to use with calves when testing the antirachitic potency of roughages.

In this study 2 lb. of sun-cured timothy hay prevented rickets in a calf up to 1 yr. of age, and 3 lb. of similar timothy cured rickets in a calf at 9 mo. of age. The same amount of sun-cured alfalfa hay prevented rickets in one calf up to 195 days of age, and 1 lb. of sun-cured alfalfa protected another calf up to 192 days of age. The vitamin D requirement increased with the age and size of the growing calf, and the requirements varied between individuals. From the standpoint of blood analyses, the calves in this test showed three distinct conditions associated with rickets—(1) normal calcium, low phosphorus, (2) low calcium, normal phosphorus, and (3) low calcium, low phosphorus.

High v. low protein grain with pasture, R. E. Horwood, G. W. Putnam, and J. G. Wells, Jr. (*Michigan Sta. Quart. Bul., 18 (1935), No. 1, pp. 22–24*).—Continuing this study (E. S. R., 70, p. 82), two groups of three cows each were fed on grass pasture for 1 mo. and on second-growth alfalfa pasture for 2 mo. One lot received a simple home-grown grain mixture of equal parts of ground barley and oats fed at the rate of 1 lb. to each 5 lb. of milk. The second group received a ration made up of ground barley, ground oats, wheat bran, and cottonseed meal fed at the same rate. The first ration contained 9.3 percent of digestible protein and the second 16.7 percent. The test was divided into three 30-day periods, and the rations were reversed at the end of each period.

The cows receiving the high protein ration produced 426.9 lb. more 4-percent milk than those on the low protein ration, but the difference was not significant. The cows on high protein received 206.1 lb. more digestible crude protein and 2.6 lb. less total digestible nutrients than those on the low protein ration. All of the low protein ration was home-grown feed, while 40 percent of the high protein ration was purchased feed.

Menhaden fish meal as a protein supplement for dairy cows, C. F. Monroe, W. E. Krauss, and C. C. Hayden (*Ohio Sta. Bimo. Bul. 176 (1935), pp. 176–183*).—In this test a grain mixture containing 8 percent of menhaden fishmeal was compared with a check mixture containing the usual protein supplements in a continuous feeding trial covering a period of 2 yr. 4 mo. and in a short-time reversal trial.

Milk and butterfat production was somewhat lower on the fishmeal ration, and the grain intake was lower, probably due to the fish odor of the mixture. The amount of grain required to produce 100 lb. of milk was approximately the same for both rations. There were fewer cases of retained afterbirth, fewer breedings required, and the birth weight of calves was heavier with more nearly normal gestation periods on the fishmeal ration. The rate of abortion was about the same in both groups. In general health and appearance the two groups did not differ.

The effect of beet tops on the flavor and odor of milk, G. M. Trout and G. E. Taylor (*Michigan Sta. Quart. Bul., 18 (1935), No. 1, pp. 37–45, figs. 2*).—Beet tops were fed to 8 dairy cows under varying conditions for a period of 10 weeks, and the milk produced was examined for beet-top flavor.

It was found that this flavor was not very noticeable until the cows received at least 25 lb. of beet tops per day. The flavor was always most noticeable in the night's milk. The intensity of the flavor increased as the amount of beet tops fed increased, being most objectionable when tops alone were fed. Feeding hay and grain seemed to eliminate a part of the beet-top flavor. From the standpoint of flavor there was little difference in feeding tops to low- or high-testing cows. Feeding tops at milking time or immediately before had a more harmful effect on flavor than feeding after milking or 1 hr. before milking. The presence of decomposed or frozen beet tops in the barn had a bad effect on the odor and flavor of milk. Beet-top flavor did not "develop" or become pronounced when milk was held in storage for 24 to 48 hr. Aeration removed some of the beet-top flavor from milk, and pasteurization improved the flavor to some extent. It is concluded that no flavor troubles should develop from the feeding of clean, high-quality beet tops when good feeding practices are followed.

Investigations regarding the influence of certain green feeds on the occurrence of fishy flavor in butter and on the iodine number of the butterfat [trans. title], B. Platon, P. Hermansson, H. Edin, and L. Hansson (*Meddel. Centralanst. Försöksv. Jordbruksomrädet [Sweden], No. 451 (1935), pp. 48, figs. 3; Eng. abs., pp. 46–48*).—For this study two or three equal groups of 15 high-producing cows were fed rations consisting of green fodder in various combinations with other feeding stuffs.

It was found that excessive feeding of young clover, lucerne (alfalfa), and sugar beet tops in fresh condition led to a tendency of the milk to produce fishy flavor in the butter. Young clover and alfalfa had a more pronounced influence in this respect than more mature alfalfa and sugar beet tops. The risk of fishy flavor could be minimized or eliminated to a large extent if the fresh feeding stuffs were supplemented to a sufficient degree with other feeds such as dried beet pulp, crushed grain, hay, and straw. Eliminating salt from a ration composed mostly of young clover had no effect on the tendency of the milk to produce fishy butter. High- and low-producing cows on alfalfa pasture gave the fishy off flavor to the same extent. Pasteurization of the cream had a considerable influence on the tendency of the butter to become fishy, and repasteurization largely counteracted fishiness in butter.

The iodine number of the buterfat changed as the ration was changed at approximately the same rate as the time required for the feed to pass through the alimentary tract. Dried sugar beet pulp and mixed crushed grain appeared to have the same influence on iodine number. In the case of rations composed wholly of alfalfa in the bud to the full-bloom stage, the iodine number averaged 45 to 47, but dropped to 39 when alfalfa made up 72 percent of the total feed units of the daily ration and the remainder consisted of crushed grain or dried beet pulp. In feeding clover only the iodine number reached 46, and when clover comprised 71 percent of the total feed units dropped to 44. In order to fix the iodine number at 36 the proportion of alfalfa would have to be reduced to 48 percent and the proportion of clover to 42 percent of the total feed units. A ration in which the sugar beet tops made up 75 percent of the total feed units gave an iodine number of 28.5, and when the proportion of beet tops was reduced to 57 percent the iodine number was 29.5. These studies show that the iodine number can be regulated by supplementing pastures with other feeds.

Period of lactation and the direct titratable chloride value of milk, P. F. Sharp and E. B. Struble (*Jour. Dairy Sci., 18 (1935), No. 8, pp. 527–538, figs. 4*).—The [New York] Cornell Experiment Station determined the chloride value of milk by the direct titration method with silver nitrate, using potassium chromate as an indicator.

The direct titratable chloride value of milk increased with the dilution of the milk and with decreasing amounts of indicator. As the acidity of milk increased, there was no influence upon the end point until after the casein had coagulated. The differences between normal morning and evening milk were slight. The fraction of the total milking of the quarter of the udder and the different quarters had little effect on the chloride values of normal milk.

The first and last milk drawn from mastitis-infected quarters was high in chloride and pH and low in titratable acidity. The middle portion often approached or fell within the range of normal mastitis-free milk in these respects. In the case of cows affected with mastitis, wide variations were found between the different quarters. In healthy cows the chloride in milk fell rapidly during the first few days of lactation, reached a minimum, increased slightly during the first 60 percent of the lactation period, and then increased more rapidly especially during the last 10 percent of the period.

There was a definite relation between the chloride value and the daily milk production of healthy cows. There was a marked increase in chloride when the production of Jersey and Guernsey cows fell below 15 lb. and when Holstein cows fell below 25 lb. per day. Milk from healthy Holstein cows tended to be higher in chloride than milk from Jersey and Guernsey cows. Gestation had a negating tendency on the increase in chlorides due to progressive lactation.

The influence of machine milking upon milk production, A. C. Dahlberg (*New York State Sta. Bul. 654 (1935), pp. 16, figs. 3*).—The data for this study were obtained from cows milked by machine at 2, 3, and 5 yr. of age and by hand at 4 yr. for complete lactation periods. Factors such as length of lactation period, length of pregnancy during lactation, dry period, methods of feeding and management, age of cows, freedom from disease, methods of operating machines, type of machine, and methods of hand milking were kept reasonably uniform.

The percentage of fat in the milk was not affected by the method of milking. The hand-milked cows produced slightly more milk, but the difference was noticable only after the third month of lactation. Cows milked by hand were more persistent in maintaining production. This difference was believed to be due to the fact that the machine was left on the cows for a relatively long time and emphasizes the desirability of removing the machine as soon as possible. The results are interpreted to show the need for correct operation of the machines rather than being adverse to their use.

The advantages of skim-milk agar for the determination of the sanitary quality of market milk, C. E. Safford and C. N. Stark (*Jour. Dairy Sci., 18 (1935), No. 8, pp. 539–546, figs. 4*).—Based on data obtained on approximately 760 samples of milk taken from the milk supply of 250 dealers representing winter, spring, and summer conditions, the [New York] Cornell Experiment Station found that fermentable carbohydrates and other milk constituents in skim milk agar made a desirable medium to use in the routine control of market milk and other dairy products.

On 618 samples of pasteurized milk the skim milk agar counts averaged two to four times as large as the corresponding counts on standard agar. The counts on 137 samples of raw milk were only slightly larger. The colonies on the skim milk agar were much larger and could be counted with greater ease and rapidity than those on standard agar. The slight opacity of the medium prevented glare when artificial lighting devices were used. Acid-producing and protein-digesting types of bacteria could be differentiated on this medium, and it supported growth of the bacteria responsible for mastitis. The medium was simple and easy to make, and no more expensive than the standard agar.

The influence of repasteurizing cream delivered by skimming stations on the keeping quality of butter [trans. title], **B. Platon and T. Olsson** (*Meddel. Centralanst. Försöksv. Jordbruksområdet* [*Sweden*], *No. 457* (*1935*), *pp. 19; Eng. abs., pp. 18, 19*).—In this study 13 paired churnings were made from cream delivered by the skimming stations to a creamery. All of this cream had been pasteurized, but one churning of each pair was subjected to renewed pasteurization in a common flash pasteurizer before the starter was added. The butter was scored by three judges from 7 to 12 days after manufacture, and 1 and in most cases 2 and 3 weeks later. The experiment was concerned only with sour-cream butter.

Fishiness was observed in all butters made from cream that was not repasteurized, while it occurred in only two samples made from repasteurized cream. This off flavor sometimes occurred in the butter made from the pasteurized cream at the time of the first scoring, while in the butter made from repasteurized cream it was not observed earlier than the third scoring. The mean score of the butter made from repasteurized cream was always higher than that made from the control cream. On the basis of these results, it is recommended that all cream delivered by skimming stations to a creamery be repasteurized.

The manufacture of brick cheese, H. L. Wilson and W. V. Price (*U. S. Dept. Agr. Circ. 359* (*1935*), *pp. 12, figs. 7*).—The procedure for manufacturing brick cheese is briefly described. The required equipment is illustrated and discussed. Although the process described is a factory process, good brick cheese may be made on the farm for home use by following these directions.

Making cheese on the farm, J. C. Marquardt (*Farm Res. [New York State Sta.], 2 (1935), No. 1, pp. 6, 8*).—Directions for making a hard cheese under farm conditions are given.

VETERINARY MEDICINE

Encyclopaedia of veterinary medicine, surgery, and obstetrics, I, II, edited by G. H. Wooldridge (*London: Oxford Univ. Press, 1934, 2. ed., vols. 1, pp. XVI+836+[2]+XLIX, pls. 2, figs. 141; 2, pp. VIII+837-1652+LI, pls. 4, figs. 221*).—A new edition of this work (E. S. R., 52, p. 280), the first volume of which deals with veterinary medicine and the second with veterinary surgery and obstetrics. Some chapters, as those on actinomycosis and actinobacillosis, milk fever, braxy, etc., have been entirely rewritten; new chapters are included as on lamb dysentery, spinal anesthesia, surgical narcosis with avertin and nembutal, and gland grafting. New chapters containing the results of deficiencies of vitamins and of hormones also have been added.

Black's veterinary dictionary, edited by W. C. Miller (*London: A. & C. Black, 1935, 2. ed., rev. and enl., pp. XII+[1]+1141, pls. 8, figs. 327*).—An enlarged edition (E. S. R., 60, p. 573), in which much new information is given in an appendix (pp. 1083–1141).

Standard classified nomenclature of disease, edited by H. B. Logie (*New York: The Commonwealth Fund, 1935, 2. ed., pp. XXI+870*).—A compilation by the National Conference on Nomenclature of Disease which has been officially approved by 27 national organizations.

Veterinary problems concerning milk (*10. World's Dairy Cong., Rome-Milan, 1934, [Proc.], Sect. 6, pp. [2]+97*).—The contributions presented at the section of the Tenth World's Dairy Congress held at Roma and Milano from April 30 to May 6, 1934, relating to infections of dairy cows and their control include the following: The Acidoproteolytes in Mammarian Infection, by C. Gorini (pp. 1–7); The Different Forms of Brucellosis and Milk, by M. Rinjard (pp. 9–23); Frequency of Animal and Human Brucellosis in Bucarest and Its Suburbs, by G. Radulesco-Calafat (pp. 25–32); The Necessity of Combating Mastitis Due to the *Streptococcus* by Sanitary Measures Internationally Unified, by O. Fettick (pp. 33–38); Brucellosis and Milk Production, by E. Roots and V. Ridala (pp. 39–42); The Different Forms of Brucellosis, by G. Gordier (pp. 43–50); The Menace of Johne's Disease in India (pp. 51–53) and The Problem of Tuberculosis in Dairy Animals in India (pp. 55–57), both by S. C. A. Datta; Infections of the Udder: How They Affect the Hygienic Value of Consumption Milk and the Derived Products of Milk, by P. Stazzi (pp. 59–65); Lacto-agglutination in the Diagnosis of Mammary Brucellosis, by V. Mazzaracchio (pp. 67–71); The Different Forms of Brucellosis and Milk, by Ficola (pp. 73–78); Eradication of the *Brucella abortus* Bang Infection of Bovine Cattle, by C. F. van Oyen (pp. 79–88); and The Extent and Causes of "Wastage" of Dairy Cows, by H. G. Sanders (pp. 89–97).

[Work in animal pathology and disease control in California] (*Calif. Dept. Agr. Mo. Bul., 23 (1934), No. 12, pp. 357–373*).—This annual report of the division of animal industry of the State Department of Agriculture considers bovine tuberculosis eradication; Bang's disease control; developments in sheep disease control; miscellaneous diseases; ship inspections for animal disease carriers; and work at the general pathological laboratory at Sacramento and at the poultry pathological laboratories at Los Angeles, Petaluma, and San Diego, all by C. U. Duckworth; and meat inspection, by A. G. Boyd.

Report of the Government veterinary surgeon for 1934, M. Crawford (*[Ceylon] Govt. Vet. Surg. Rpt., 1934, pp. 16*).—The occurrence of and control work with infectious diseases of livestock, particularly rinderpest, rabies, bovine tuberculosis, Bang's disease, and schistosomiasis, are reported upon (pp. 1–8).

[Contributions on animal pathology] (*Onderstepoort Jour. Vet. Sci. and Anim. Indus.*, *4* (*1935*), *No. 2, pp. 245–433, figs. 51*).—The contributions presented relating to animal pathology (E. S. R., 73, p. 537) are as follows: The Symptomatology and Treatment of *Trypanosoma congolense* Infection of Canines (pp. 247–250), Symptomatology of Some Trypanosomiases of Domestic Animals (pp. 251–267), A Short Study of Bovine Anaplasmosis, with Special Reference to the Chemotherapy (pp. 269–280), The Treatment of *T[rypanosoma] brucei* Infection of Equines with Antimosan (pp. 281–284), Antimosan-Fastness of *T[rypanosoma] congolense* (pp. 285, 286), and The Intravenous Administration of Styrylquinoline in Equine Trypanosomiasis (pp. 287, 288), all by B. S. Parkin; Studies on the Neurotropic Virus of Horsesickness—I, Neurotropic Fixation (pp. 291–322), II, Some Physical and Chemical Properties (pp. 323–348), III, The Intracerebral Protection Test and Its Application to the Study of Immunity (pp. 349–377), and IV, The Pathogenesis in Horses (pp. 379–388), all by R. A. Alexander; A Rickettsia-like Organism and an Unknown Intracellular Organism of the Conjunctival Epithelium of Goats, by J. D. W. A. Coles (pp. 389–395); Recent Investigations into the Toxicity of Known and Unknown Poisonous Plants in the Union of South Africa (pp. 399–415) (E. S. R., 72, p. 529) and Plant Poisoning in Stock and the Development of Tolerance (pp. 417–420) (E. S. R., 72, p. 529), both by D. G. Steyn; and *Psilocaulon absimile* N. E. Br. as a Stock Poison—II, Isolation of the Toxic Alkaloidal Constituent and Its Identification as Piperidine Hydrochloride, by C. Rimington (pp. 421–433) (E. S. R., 70, p. 828).

Laboratory infections due to Brucella in the United States, K. F. Meyer (*Jour. Bact.*, *29* (*1935*), *No. 1, pp. 43, 44*).—In reply to a questionnaire, 17 organizations or institutes are said to have reported for the period 1922–34 a total of 57 clinically recognized infections directly traceable to routine or research work with *Brucella* organisms. In 45 of these infections, 6 percent of the clinical cases, the causative organism was isolated in blood cultures. *B. melitensis* was the offender in 53.8 percent, *B. abortus suis* in 42.3 percent, and *B. abortus bovis* in 3.9 percent of the successful cultures. The course of the disease was mild in about one-half of the patients, and the duration from 1 to 2 weeks.

On natural antibodies in the rabbit and hereditary resistance to infections of Brucella suis, M. R. Irwin and F. N. Bell (*Jour. Infect. Diseases*, *57* (*1935*), *No. 1, pp. 74–77*).—In studies conducted at the Wisconsin Experiment Station, "low and high bactericidal action of citrated whole blood of rabbits was highly correlated with susceptibility and resistance to *B. suis*. Rabbit blood in these tests had a much greater bactericidal action against *B. abortus* than against *B. suis*. Further specificity of the bactericidins was shown by the independent action toward *B. suis* and *S[almonella] enteritidis*."

Anti-abortus serum, C. A. Mitchell, F. A. Humphreys, and R. V. L. Walker (*Canad. Pub. Health Jour.*, *26* (*1935*), *No. 5, pp. 209–214, fig. 1*).—A method of preparing a *Brucella abortus* antiserum, with experimental observations of its protective properties against *B. abortus* infection of guinea pigs, is described. The administration of this serum in cases of undulant fever in man is said to have given very encouraging results.

Aujeszky's disease [trans. title], L. F. D. E. Lourens (*Tijdschr. Diergeneesk.*, *62* (*1935*), *No. 18, pp. 949–964; Ger., Eng., Fr. abs., pp. 963, 964*).—A discussion of Aujeszky's disease presented with a list of 72 references to the literature.

A contribution to the serological classification of Pasteurella strains, H. S. Yusef (*Jour. Path. and Bact.*, *41* (*1935*), *No. 1*, *pp. 203–206*).—By the use of a precipitin absorption technic it was found possible to classify 14, representing 8 serological groups, out of 21 *Pasteurella* strains. The method, although needing further adjustment, was found to compare well with the agglutinin absorption method as previously applied to the same strains by Cornelius (E. S. R., 62, p. 169).

Vectors of relapsing fever in relation to an outbreak of the disease in British Columbia, E. Hearle (*Canad. Med. Assoc. Jour.*, *30* (*1934*), *No. 5*, *pp. 494–497*).—The report of an outbreak of relapsing fever in the Kootenay district of British Columbia by J. H. Palmer and D. J. M. Crawford[3] led the author to investigate the agency of transmission. He is led to conclude that pack rats (*Neotoma cinerea*), which are very plentiful in the less settled districts of the Kootenays and infest cabins as soon as they are completed and invariably winter in vacant cabins, caves or crevices in rocky cliffs, and in hollow trees, may serve as reservoirs for the spirochetes and serve as a suitable host for the tick carriers during the absence of human tenants. The discovery by R. R. Parker of a mountain camp near Moscow, Idaho, to be infested by *Ornithodoros turicata* has led the author to suggest that a similar infestation in the Kootenay district may explain the manner of transmission.

Absorption of bacteriophage by Salmonella, P. Levine and A. W. Frisch (*Jour. Infect. Diseases*, *57* (*1935*), *No. 1*, *pp. 104–117*).—It was found that "the specificity of the fractions in the polyvalent phages studied is, on the whole, referable to the several serological groups of the Salmonella as determined by their heat-stable factors. Several strains of the *kunzendorf* type of *suipestifer* are characterized by a capacity to absorb also other phages or corresponding fractions of polyvalent phages. The organisms of the *typhosus-enteritidis* group and those of the *aertrycke-paratyphosus* B groups could not be differentiated from each other; however, soluble bacterial extracts gave specific phage inhibiting reactions. Although the strain *glässer-voldagsen* is resistant to the action of phage, it, nevertheless, absorbs specifically."

A list is given of 39 references to the literature.

Sensitivity to nascent phage as a character for the differentiation of the beta type of streptococci, A. C. Evans (*Jour. Bact.*, *29* (*1935*), *No. 1*, *p. 40*).—The author has found *Streptococcus equi* to be "distinguished from other streptococci by its sensitivity to all of the 4 types of phage in the nascent state (that is, in the presence of a sensitive strain). In a large collection of strains now being studied, certain strains which fermented lactose must be regarded as belonging to a variety of *S. equi* on account of their ability to produce strangles in horses and their sensitiveness to the 4 types of phage. Five out of 22 strains from strangles fell into the lactose-fermenting variety.

"Not one of the collection of over 300 strains of hemolytic streptococci from a great variety of human diseases fully agreed with any of the streptococci from strangles."

Modification of the virulence of tubercle bacilli, N. Plum, trans. by H. Andersen (*Skand. Vet. Tidskr.*, *25* (*1935*), *No. 7*, *pp. 397–472*; *Dan. abs.*, *pp. 461–464*).—This contribution reporting work conducted at the State Veterinary Serum Laboratory at Köbenhavn (Copenhagen) during the years 1925–30 is presented with a list of 131 references to the literature reviewed. The author found that it is actually possible with the technic described to modify the character of virulence in tubercle bacilli.

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[3] Canad. Med. Assoc. Jour., 28 (1933), No. 6, pp. 643–647, figs. 2.

Experiments relative to vaccination against tuberculosis with the Calmette-Guérin bacillus (B C G), B. J. Clawson (*Arch. Path.*, *20* (*1935*), *No. 3*, *pp. 343–368*).—The author concludes that the "vaccination of nonallergic animals by any of the four methods described is not followed by mechanical injuries or by immediate or delayed toxic results. With large doses of the vaccine administered intravenously to allergic animals toxic effects may follow, but with moderate doses no delayed toxicity is noted. Allergy is greatest in frequency and degree in animals vaccinated subcutaneously with living B. C. G., next greatest in animals vaccinated intravenously with living B. C. G., and least in animals vaccinated subcutaneously with heat-killed B. C. G.; but it does not occur at all in animals vaccinated intravenously with heat-killed B. C. G. Allergy appears at the latest in from 2 to 3 weeks. It tends to disappear in from 1 to 3 mo., depending on the degree. Allergy never develops in the absence of lesions. The susceptibility to the development of lesions is increased by existing allergy."

A biological, bacteriological, and clinical study of larval or maggot therapy in the treatment of acute and chronic pyogenic infections, G. C. Weil, R. J. Simon, and W. R. Sweadner (*Amer. Jour. Surg.*, *n. ser.*, *19* (*1933*), *No. 1*, *pp. 36–48*, *figs. 5*).—In this discussion the authors deal with the biology of *Lucilia sericata* and the cultivation and sterilization of its larvae, and report upon bacteriological studies of the larva as produced for use in surgical wounds and upon a clinical study made of its use in surgical conditions for which the term "larval therapy" is suggested.

The results obtained by the use of maggots are said to compare favorably with any other form of treatment and in most instances to be far superior. Its value in the treatment of gas bacillus infection and other soft tissue infections is said to be outstanding. The authors never observed any deleterious activity of the larvae upon normal viable human tissues. Aside from the scavenger action, the larvae are considered to produce a definite excretory proteolytic substance which hastens liquefaction of devitalized tissue.

A list is given of 19 references to the literature.

The rôle of surgical maggots in the disinfection of osteomyelitis and other infected wounds, W. Robinson and V. H. Norwood (*Jour. Bone and Joint Surg.*, *15* (*1933*), *No. 2*, *pp. 409–412*).—In a study of the means by which the destruction of bacteria is brought about by surgical maggots which ingest bacteria in large numbers, cultures were made of aseptic dissections of their alimentary tract. An abundance of bacteria was found in the fore-stomach, decreasing numbers in the hind-stomach, and apparently a total disappearance of the bacteria in the intestine, indicating that ingested bacteria are destroyed in passing through the alimentary tract.

The work indicates that the effects obtained in the maggot treatment of infected wounds are due to the action of living maggots in the wound, and that living maggots cannot be eliminated in treatment.

Allantoin, a constituent of maggot excretions, stimulates healing of chronic discharging wounds, W. Robinson (*Jour. Parasitol.*, *21* (*1935*), *No. 5*, *pp. 354–358*).—This further contribution is presented with a list of 10 references to the literature.

Selected references on the toxicity of selenium, compiled by **R. A. Osborn** (*U. S. Dept. Agr.*, *Bur. Chem. and Soils* [*1935*], *pp.* [*1*]+*11*).—Following a list of general references on the toxicity of selenium, lists are given of those referring to elementary and colloidal selenium; plants containing selenium; the biochemical action of selenium compounds; selenites and selenates; bacterial and fungicidal relations; and the therapeutic use of selenium in cancer, tumors, and tuberculosis.

The medicinal and poisonous sedges of India, J. F. Caius (*Jour. Bombay Nat. Hist. Soc., 38 (1935), No. 1, pp. 163–170*).—An account is given of the medicinal and poisonous sedges of India, which belong to seven genera, namely, *Carex, Cyperus, Fimbristylis, Juncellus, Kyllinga, Remirea,* and *Scirpus.*

The effect of starvation on the anthelmintic efficiency of sodium arsenite and tetrachlorethylene, I. Clunies Ross and H. McL. Gordon (*Aust. Vet. Jour., 11 (1935), No. 3, pp. 106–109*).—It was found that, "as in the case of copper sulfate and carbon tetrachloride, withholding food and water for 24 hr. prior to treatment had no influence on the anthelmintic efficiency of sodium arsenite or tetrachlorethylene. When sodium arsenite and tetrachlorethylene were given in the dose rate usually prescribed for lambs of the age of those in the experiment, an extremely low efficiency was obtained with both drugs, while a second treatment with the full adult dose of tetrachlorethylene was also unsatisfactory.

"The need for further tests as to the efficiency of sodium arsenite and tetrachlorethylene against *H[aemonchus] contortus* is indicated. It is suggested that the results obtained are due to the failure of the drugs to enter the abomasum direct in the majority of cases."

Efficiency of certain drugs against Haemonchus contortus, with a note on the treatment of trichostrongylosis, H. McL. Gordon (*Aust. Vet. Jour., 11 (1935), No. 3, pp. 109–113*).—The author found sodium arsenite and tetrachlorethylene to be very variable and of a low average efficiency against *H. contortus,* even when administered to lambs in a higher dose rate than that usually recommended. "In contrast, the combination of copper sulfate and sodium arsenite, and carbon tetrachloride in 1 and 2 ml doses to lambs gave a high average and constant efficiency. It is considered that the great increase in efficiency of sodium arsenite when administered in combination with copper sulfate is due to the fact that it passes direct to the abomasum, whereas when administered alone it may enter the rumen. The variation in efficiency of tetrachlorethylene is probably due to the same factor.

"Of a great variety of drugs tested against *Trichostrongylus* spp., only combinations of copper sulfate and carbon disulfide and copper sulfate and Black Leaf 40 (40 percent nicotine sulfate) gave any evidence of efficiency. A single treatment with copper sulfate and Black Leaf 40 brought about a marked and permanent decrease in egg production of *Trichostrongylus* spp. in the majority of animals treated. In the absence of any other method of treatment for trichostrongylosis, it is suggested that copper sulfate and Black Leaf 40 should be tried."

A homemade cattle spray, C. B. Dibble (*Michigan Sta. Quart. Bul., 18 (1935), No. 1, pp. 5–7*).—Directions are given for the preparation and use of a fly spray consisting of 0.5 lb. of pyrethrum and 1 gal. of oleum spirits or mineral spirits.

The dissemination of human pathogenic streptococci through the cow's udder, D. J. Davis (*Jour. Bact., 29 (1935), No. 1, pp. 42, 43*).—A discussion of the streptococcus infections of the cow's udder.

Studies on aseptically drawn milk from Bang's disease positive and Bang's disease negative cows, H. B. Morrison and F. E. Hull (*Jour. Dairy Sci., 18 (1935), No. 7, pp. 470, 471*).—Determinations made from 1931 to 1934 of the bromothymol blue reaction, leucocyte counts, bacterial counts, agglutination tests for *Brucella abortus,* and the titratable acidity of milk drawn aseptically from 57 cows in the Kentucky Experiment Station dairy herd are reported upon.

Of 132 samples from the 18 positive cows in the herd, 43.2 percent gave reactions to the bromothymol blue test while from the 44 negative cows only 4.2 percent showed reactions.

The leucocyte counts of the samples from the positive cows averaged 1,291,000 per cubic centimeter, as compared with 441,000 per cubic centimeter for samples from the negative cows. The average leucocyte count of the samples reacting to the bromothymol blue test was 2,326,000 per cubic centimeter, and for the samples normal to this test the average was 395,000 per cubic centimeter. The average leucocyte count of all samples was 639,000 per cubic centimeter.

Of the 132 samples from the positive cows 38.6 percent gave reactions to the agglutination têst, 20 of which samples also reacted to the bromothymol blue test. Sixty-eight samples from this group reacted to one of these tests but not to the other, while 44 samples gave negative reactions to both the agglutination and bromothymol blue tests.

Formol vaccine for blackleg [trans. title], F. L. HUBER and F. C. KRANEVELD (*Nederland. Indische Bl. Diergeneesk., 47 (1935), No. 2, pp. 61–94; Ger., Eng. abs., pp. 90–92*).—The experiments reported indicate that in cattle immunity to blackleg sets in more promptly after injection of formol-vaccine than when carbol-filtrate is used. No difference could be determined in the degree of immunity set up by the two immunizing substances in sheep and cattle in the experiments reported. Both injection substances gave the animals a very high grade of immunity. The formol-vaccine proved to be an extraordinarily good injection against blackleg. It seems preferable to the carbol-filtrate, among other reasons because of the much greater ease with which it can be prepared. The formol-vaccine used in the experiments was a mixture of equal parts of 14-day-old cultures of four different native blackleg strains in liver bouillon, killed by the addition of 4 per mill of formalin. The killing of the cultures was always found to be sufficient and satisfactory after 48 hours' incubation at 39° C. It must not be forgotten, however, that in this respect it is possible that different strains may react differently.

A list is given of 44 references to the literature.

Globidiosis in Indian cattle, with a description of a new species, S. R. HASSAN (*Indian Jour. Vet. Sci. and Anim. Husb., 5 (1935), No. 2, pp. 177–183, pls. 3*).—Post-mortem findings and the results of gross and microscopic examinations here reported have led to the description of a new species under the name *Globidium fusiformis*. It resembles in some respects *G. faurei* (*G. gilruthi*), a species common in the abomasum of sheep in England, France, and Australia, in the size, shape, and form of the spores and in the behavior of the spores and cysts.

The detection and control of bovine mastitis, G. J. HUCKER (*Jour. Dairy Sci., 18 (1935), No. 7, pp. 469, 470*).—This contribution from the New York State Experiment Station relates to work noted (E. S. R., 73, p. 683).

Further observations on mastitis, F. B. HADLEY (*Vet. Med., 30 (1935), No. 8, p. 357*).—A brief discussion of the effect of mastitis upon the nutritive value of milk. Surveys in Wisconsin indicate that approximately one-third of all dairy cows in the State have chronic mastitis in some degree, and that about 50 percent of their quarters are secreting abnormal milk.

A study of the morphology and life cycles of the organism of pleuropneumonia contagiosa bovum (Borrelomyces peripneumoniae nov. gen.) by observation in the living state under dark-ground illumination, A. W. TURNER (*Jour. Path. and Bact., 41 (1935), No. 1, pp. 1–32, pls. 6, figs. 89*).—This report of studies of which an earlier account has been noted (E. S. R., 73, p. 684) is accompanied by a list of 53 references to the literature. The life cycles and morphology of the causative organism of contagious pleuropneumonia of the bovine were studied in the living state by dark ground observation of macro- and micro-cultures in a new fluid medium, V. F.-O. S. broth.

The pathology of rickets in dairy calves, H. E. Bechtel, E. T. Hallman, and C. F. Huffman (*Jour. Dairy Sci., 18 (1935), No. 7, pp. 432, 433*).—The changes found in low vitamin D rickets in dairy calves were always preceded by decreased concentrations of calcium and/or inorganic phosphorus in the blood plasma. "In the specimens studied, histological changes were confined largely to a relatively small portion of the bone at the costochondral junction. Retarded provisional calcification of the cartilage matrix appeared to be the fundamental change in rickets. However, the most conspicuous changes in microscopic study were irregular removal of cartilage by the embryonic marrow and accumulation of excess osteoid tissue. The beading of ricketic ribs appeared to be caused by accumulations of osteoid tissue, but was exaggerated in gross appearance on the medial border of the rib by increased curvature of the rib in a medial direction. Cupping of the ventral-epiphyseal end of the diaphysis was not a prominent feature in roentgenograms of the costochondral junctions of ricketic calves. Growth was an important modifying factor in rickets. More severe rickets was associated with more rapid growth. Younger calves developed more florid rickets than did older calves under similar management.

"Low plasma calcium rickets appeared in this study to be histologically identical with rickets in which there were decreased concentrations in the plasma of both calcium and inorganic phosphorus."

The report is based upon a study of 5 normal and 11 ricketic grade-Holstein calves in which the duration of the disease varied from 38 to 212 days.

Studies on surra.—III, A survey of the incidence of surra in the vicinity of the college of agriculture, with observations on numerical fluctuations of tabanid flies, M. Manresa and O. Mondoñedo (*Philippine Agr., 24 (1935), No. 2, pp. 111–125, fig. 1*).—In continuation of earlier work with surra (E. S. R., 73, p. 682), "no case of trypanosomiasis was found in the vicinity of the college of agriculture in 94 horses examined, 52 of which were tested two times, 14 three times, and 9 four times. No case of trypanosomiasis was found in 117 oxen examined, of which 69 were tested two times, 20 three times, and 3 four times. Only 1 definitely positive surra case was found in 283 carabaos examined, 93 of which were tested two times, 32 three times, and 21 four times.

"The *Tabanus striatus* Fab. was found to be present throughout the whole period of observation, being most prevalent during the hour before dusk, less so between 6 o'clock in the morning and about 5 o'clock in the afternoon. Horses were less frequently visited by tabanids than oxen, and animals kept under shelter were less frequently visited than those kept in the open fields.

"The intensity of surra outside of the college grounds and fields was very much lighter than it was inside of these fields. This, together with other data, make the evidence conclusive in showing that the immediate source of the outbreak of surra in 1933 in the college of agriculture originated from within and shortly before the disease was observed in the animals of the department of animal husbandry."

Bovine surra in India, with a description of a recent outbreak, P. R. Krishna Iyer and S. M. Sarwar (*Indian Jour. Vet. Sci. and Anim. Husb., 5 (1935), No. 2, pp. 158–170*).—This contribution is presented with a list of 27 references to the literature.

Single cell transmission of surra, T. Topacio (*Philippine Jour. Anim. Indus., 2 (1935), No. 3, pp. 213–224*).—In further work by the author[8] it was found that the inoculation of single surra trypanosomes by implantation under the skin or in the peritoneal cavity of rats, mice, guinea pigs, dogs, and 1 horse produced infection and death. The percentage of successful infection in various animals was, for rats 64, mice 33⅓, guinea pigs 37½, and dogs and the horse 100.

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[8] Philippine Jour. Sci., 51 (1933), No. 4, pp. 631–635, pls. 4.

"The average incubation periods were, rats inoculated subcutaneously 10 days, inoculated intraperitoneally 8.6 days; mice inoculated subcutaneously 9 days; guinea pigs inoculated subcutaneously 19 days; dogs and horse inoculated subcutaneously 13 days for the former and 10 days for the latter.

"The average survival periods among infected animals from the time their blood became positive for trypanosomes were, rats inoculated subcutaneously 5.4 days, inoculated intraperitoneally 7.5 days; mice inoculated subcutaneously 2 days; guinea pigs inoculated subcutaneously 39.6 days; dogs inoculated subcutaneously 36 days; and horse inoculated subcutaneously 1 day.

"In the light of the positive results obtained in the preceding experiments, and in the absence of a true intermediate host of the surra organisms, the theory of the mechanical transmission of the disease through the agency of flies may now be considered as fully established until other instruments of transmission become known."

A list is given of 21 references to the literature.

Susceptibility of native carabaos to experimental tuberculosis.—Preliminary report, T. Topacio (*Philippine Jour. Anim. Indus., 2 (1935), No. 2, pp. 181–191, pls. 4, fig. 1*).—It has been found that the infected tissues of rabbits inoculated with a virulent bovine culture following injection to cattle, carabaos, goats, rabbits, and guinea pigs produced clinical tuberculosis and death, the lesions being generally more emphasized in the lungs than in other organs. Typical lesions of tuberculosis were observed in all the animals that died or were killed in the experiments except the carabao calf, which succumbed too early. A mature carabao 5 yr. old died of "galloping consumption" 37 days after the injection of a suspension of infected lungs from a diseased rabbit. The mature native carabao was shown to be susceptible to experimental tuberculosis by contact infection.

"Pure cultures of tubercle bacilli were recovered from the spleen and liver of guinea pigs which died from the injection of a suspension of tuberculous lung of contact Carabao No. 1190, thereby fulfilling Koch's postulate and establishing the identity of the infection by contact. It appears that the prevailing opinion on the apparent high resistance of the native carabao to tuberculosis must now be modified; for, given the necessary conditions of confinement and exposure, it was shown that it contracts the disease by contact, at least, insofar as experimental tuberculosis is concerned, under the conditions of the experiment just described. From the present study, tuberculin testing of dairy carabaos for the detection of tuberculosis suggests itself as a necessary sanitary and control measure."

Enzootic marasmus: The determination of the biologically potent element (cobalt) in limonite, E. J. Underwood and J. F. Filmer (*Aust. Vet. Jour., 11 (1935), No. 3, pp. 84–92, figs. 3*).—Descriptions are given of experiments with various fractions of "iron-free" extract of limonite in curing enzootic marasmus.

"Positive results have been consistently obtained with the 'zinc group' and with no other fraction of this extract. Twenty-one sheep have been cured with iron-free mineral supplements. Seven sheep have been cured with traces of cobalt, one of the zinc group of elements. It is suggested that enzootic marasmus is due to a deficiency of cobalt in the food. It appears that cobalt must be regarded as an essential element in animal nutrition."

A hitherto undescribed piroplasm of goats (Piroplasma taylori), S. M Sarwar (*Indian Jour. Vet. Sci. and Anim. Husb., 5 (1935), No. 2, pp. 171–176, pls. 4*).—A description is given of a piroplasm that differs from recorded species occurring in goats and sheep, to which the name *P. taylori* is given. It was taken at post mortem from a 3-year-old goat in the Punjab that died after 2 or 3 days' illness.

Carbon disulphide for the removal of stomach worms from swine, J. Bozicevich and W. H. Wright (*Vet. Med., 30 (1935), No. 9, pp. 390–393*).—Details of the results of anthelmintic tests for the removal of stomach worms from swine are given in tabular form. "Carbon disulfide administered by stomach tube or in capsule to 30 swine at dose rates varying from 0.027 to 0.22 cc per kilogram of body weight, after a preliminary fast of 30 to 48 hr., showed an average efficacy of 85.8 percent for the destruction of *Hyostrongylus rubidus* and 96.4 percent for *Ascarops strongylina*. While none of the pigs employed in these tests were infested with *Physocephalus sexalatus*, it would appear probable that the drug would be effective against this species also; naturally this requires experimental demonstration.

"Four of 30 pigs showed reactions to the treatment; these reactions consisted of vomiting, dizziness, and, in one case, prostration. Two of these pigs received the highest dose rates employed, i. e., dose rates of 0.2 to 0.22 cc per kilogram of body weight.

"Gastritis of varying degree was observed in 27 of the 30 pigs treated with carbon disulfide. The available evidence indicates that the gastritis is transitory and probably not of serious import.

"It appears that the minimum dose rate at which the drug can be administered with safety in order to obtain satisfactory results for the destruction of swine stomach worms is 0.1 cc per kilogram, or 4.5 cc per 100 lb. of body weight."

An immunological study in laboratory animals of thirteen strains of equine encephalomyelitic virus, B. F. Howitt (*Jour. Bact., 29 (1935), No. 1, p. 61*).—A comparative immunological study was made by the author of 13 different strains of equine encephalomyelitic virus (Meyer, Haring, and Howitt). "The 11 strains isolated from different parts of the United States could be divided serologically into 2 groups, an eastern and a western. Of the 2 foreign viruses, the 1 from Argentina was classified with the western series, while that from Russia was immunologically distinct from the other 2 groups and varied in several other characteristics.

"There was no in vitro cross-neutralization nor in vivo protection between sera of any group when tested against the heterologous viruses.

"Animals immunized to each member of the 3 divisions showed a constant tissue immunity within their own groups when tested intracerebrally, but cross-injection experiments were not conclusive except for the Russian strain. A certain percentage of guinea pigs immune to the American western strains showed immunity when tested with the eastern, and vice versa. There was no cross-immunity between the Russian strain and either of the 2 American groups.

"Comparison of potency was best demonstrated by titration methods."

The treatment of canine ancylostomiasis with hexylresorcinol, L. M. Yutuc and M. A. Tubangui (*Philippine Jour. Anim. Indus., 2 (1935), No. 2, pp. 193–198*).—In the experiments conducted the administration of a single dose of hexylresorcinol removed from 91.75 to 96.98 percent of hookworms (*Ancylostoma braziliense* and *A. caninum*), as judged by the egg-counting method. "By the same method 12.5 to 42.1 percent of the cases were found negative after treatment and could, therefore, be considered as having been completely cured; by killing the animals, however, it was found that only 10.52 to 12.5

percent of them were really free from the parasites. This indicated that either the egg-counting technic employed was not sufficiently accurate to detect light hookworm infestations or the drug might have an inhibitive effect on the egg-laying capacity of the female parasites."

The etiology of fowl paralysis, leukemia, and allied conditions in animals, I, II, M. W. Emmel (*Florida Sta. Bul. 284* (*1935*), *pp. 59*).—In the first or introductory part of this contribution (pp. 5–18), the history and a bacterial theory of the etiology of these diseases, including fowl paralysis and leukemia, are given, accompanied by a list of 76 references to the literature. An earlier contribution has been noted (E. S. R., 73, p. 109).

The second part of the contribution (pp. 19–59) reports upon the intravenous injection of suspensions of *Salmonella aertrycke* in the chicken, the details of which are given in 10 tables, accompanied by a list of 30 references to the literature. It was found that the "intra-yolk sac injection of small amounts of *S. aertrycke* in baby chicks resulted in a septicemic disease. In such chicks hemocytoblastosis was evident in blood smears taken shortly before death, which resulted after 2 to 8 days.

"Under the conditions of these experiments suspensions of various densities of 24-hr. cultures of *S. aertrycke* administered in repeated intravenous injections over varying periods of time to chickens over 12 weeks of age resulted in hemocytoblastosis, fowl paralysis, myeloid leucosis, erythroleucosis, 'light', and anemia. Lymphocytoma occurred as a complication in a few instances. Smears on nutrient agar plates from the tissues of birds which died showing the above pathologic manifestations failed to yield positive cultures of the causal micro-organism.

"Hemocytoblastosis developed in at least 7 days after the intravenous injection of *S. aertrycke* and persisted throughout the incubation period in those cases which developed the pathologic manifestations observed, or for 4 to 5 mo. in those cases which recovered. Birds often recovered from severe cases of hemocytoblastosis. Age is an important factor in resistance; it was necessary to expose yearling hens to twice the number of *S. aertrycke* as 12-week-old birds to obtain comparable results.

"The incubation period of fowl paralysis induced by repeated injections of *S. aertrycke* was from 11 to 147 days, of leukemia from 27 to 253 days, and of anemia and light from 12 to 31 days."

Lymphomatosis in relation to fowl paralysis, J. Furth and C. Breedis (*Arch. Path.*, *20* (*1935*), *No. 3*, *pp. 379–428*, *figs. 16*).—The authors have found that "the virus of leucosis strain 2 brings about neoplastic growth of lymphocytes with characteristic morphologic and biologic properties. Injected intramuscularly it produces no tumors at the site of injection. The neoplastic cells produced by it in the blood-forming organs behave like the leukemic lymphocytes of mammals and can be grafted readily in muscle tissue, where they undergo autonomous multiplication and produce tumors.

"Two transmissible strains of neurolymphomatosis (strains 5 and 6) that can be readily passed from diseased to healthy chickens by an inoculum containing viable lymphocytes are described. The transmitting agent became inactivated by freezing at —80° C. for 30 min. or by drying from the frozen state.

"The blood of paralyzed chickens contains the transmitting agent in high concentration during the entire course of illness, and when introduced by the intravenous route it produces neurolymphomatosis indistinguishable from the spontaneous disease. Blood cells readily transmit the disease, but plasma does not. The transmissibility of the disease by a virus, though probable, is not proved.

"After intraneural injection of tissues from paralyzed birds the inoculated nerve becomes greatly thickened, and general neurolymphomatosis follows. The disease spreads along the course of the nerve fibers, but the cord is seldom infiltrated and distant lesions are probably the result of hematogenous spread.

"Lymphomatous infiltration and tumors of the viscera may be caused by the same virus that produces neurolymphomatosis. Neurolymphomatosis is usually unassociated with morphologic blood changes, but in rare instances it is associated with lymphoid leukemia. Neurolymphomatosis is a neoplastic disease allied to leucosis and sarcoma, but it is not produced by the agent that causes erythroleucosis and myeloid leucosis; neither does the agent of neurolymphomatosis produce erythroleucosis and myeloid leucosis."

Slow lactose fermenting bacteria pathogenic for young chicks, K. H. Lewis and E. R. Hitchner (*Jour. Bact., 29 (1935), No. 1, pp. 22, 23*).—A study made of the characteristics of a micro-organism, isolated in Maine from several lots of infected chicks, which exhibited symptoms simulating pullorum disease, is reported upon. The delayed fermentation of lactose served to differentiate it from *Salmonella pullorum* and the other recognized fowl pathogens. The organism is pathogenic for guinea pigs and young chicks, and in the latter produces symptoms and pathological changes which resemble those in pullorum disease. Because of the peculiar combination of characteristics displayed by this organism and the unsatisfactory state of bacterial nomenclature with respect to the slow lactose fermenting organisms, no specific name is suggested.

A system of control and prevention of intestinal parasites of poultry (Ascaridia and tapeworms), H. J. Stafseth (*Michigan Sta. Quart. Bul., 18 (1935), No. 1, pp. 3–5*).—Helminth control work by the station has led to the following recommendations: "Treat all the birds worth keeping with Iodine Vermicide Merck as soon as a diagnosis of worm infestation has been made. . . . If the premises are thought to be heavily contaminated the treatment should be repeated in 3 to 4 weeks. For the greatest possible protection to the next crop of chickens, three treatments should be applied, the first while the birds are on the range, the second one at the time of placing the birds in the laying house, and the third one at the end of the fly season; in other words, after the frost has disposed of most of the intermediate hosts. If only a single preventive treatment is deemed advisable, it should be given after heavy frosts have taken place.

"Since Iodine Suspensoid Merck kills worms and worm eggs, it is obviously the ideal disinfectant for contaminated poultry houses and should be used where it is desired to kill parasites and their eggs as well as coccidia, bacteria, and fungi. No other presently known disinfectant, suitable for practical use, will kill all these disease-producing organisms."

Avian psittacosis, K. F. Meyer and B. Eddie (*Jour. Bact., 29 (1935), No. 1, p. 67*).—The course of psittacosis was observed for a period of 295 days among ricebirds and parakeets in small cages and also in a large aviary. "Spontaneous psittacosis among ricebirds is a rapidly fatal disease. In exposure experiments the longest incubation time recorded was 98 days. The virus present in the organs is discharged in the urine, fecal droppings, and nasal mucus. Parakeets are less susceptible to psittacosis than ricebirds. Latent infections are quite common and of greatest importance in the epidemiology of human and avian psittacosis. Immature and unmasked parakeets succumb more readily to the virus than the mature breeding birds. The latent infections in a flock of parakeets may, within 6 to 8 mo., be reduced to 1 to 2 percent. These carriers are noninfectious. With the resumption of breeding operations after an elapse of from 6 to 8 mo., psittacosis will flare up again and parrot fever in young and even old birds will be noted."

Ulcerative enteritis in ruffed grouse, E. K. LeDune (*Vet. Med., 30 (1935), No. 9, pp. 394, 395*).—The investigation made of an outbreak of a disease that was fast depleting the young ruffed grouse being raised in confinement at the Urbana Game Farm in Champaign County, Ohio, is reported upon. Lesions found in an autopsy of two birds that had succumbed to the disease led to the conclusion that death was due to ulcerative enteritis, the so-called "quail disease."

AGRICULTURAL ENGINEERING

The agricultural situation in the irrigation States, July 1, 1935 (*U. S. Dept. Agr., Bur. Agr. Engin. [1935], pp. 15*).—This mimeographed report describes agricultural conditions in the irrigation States as they stood on or about July 1, 1935, with particular reference to water supply.

Salinity of irrigation water and injury to crop plants, F. M. Eaton (*Calif. Citrogr., 20 (1935), Nos. 10, pp. 302, 322, 324, 326, fig. 1; 11, pp. 334, 362–365, figs. 5*).—In a contribution from the U. S. D. A. Bureau of Plant Industry, data are summarized on salt accumulations in irrigation water and the mechanism of injury to crop plants. This information is essential in connection with the drainage of irrigated lands.

The flow of water in pipes, sewers, and channels, over weirs and off catchments, G. B. Williams (*London: Chapman & Hall, 1934, pp. 76 [figs. 48]*).—This reference book contains velocity formulas for sewers, pipes, and channels; data on velocities and discharges in sewers, pipes, and channels; discharge diagrams for weirs and notches; and data relating to catchments.

A method of determining the flow-net in soil seepage, M. G. Ionides (*Engineering [London], 140 (1935), No. 3633, pp. 211, 212, figs. 5*).—A methodology and apparatus for presenting an exact representation of the flow lines in soil seepage are briefly described. The apparatus is primarily suitable for structures subject to small head.

Calculated net income resulting from level terraces on Richfield silt loam soil and suggested lines of defense against wind erosion, H. A. Daniel (*[Oklahoma] Panhandle Sta., Panhandle Bul. 58 (1935), pp. 14, figs. 2*).—A summary and analysis of data from terraced fields is presented.

Grain yields from terraced and unterraced plats were secured on Richfield silt loam soil from 1926 to 1935, inclusive, at Goodwell, Okla. The terraced land yielded 31.08 bu. more per acre than the adjacent unterraced land, or an average of 3.1 bu. annually.

Terraces placed about 35 ft. apart on land with about 1 percent slope were found to be more efficient from a crop-production standpoint. These terraces increased the crop yield 286.9 lb. per acre over the unterraced land during the last 6 yr. The plats with terraces about 70 ft. apart made an average gain of 102.8 lb. per acre, and the land with terraces about 140 ft. apart made an average gain of 99 lb. per acre.

The average cost per acre for building broad-base terraces, not including labor, was 77 ct. The extra cost of cultivating terraced and contoured land was estimated to vary from 20 to 50 ct. per acre annually.

The total calculated increase in income due to terracing over the adjacent unterraced land was $23.33 per acre for the last 10 yr. The total expense of building the terraces and cultivating on the contour was estimated at $5.77 per acre, making the calculated net income $17.56 per acre for the decade, or an average annual net income of $1.75 per acre.

Suggested lines of defense against wind erosion are also discussed.

A list of 14 references to work bearing on the subject is included.

Rammed earth in building construction, R. L. Patty (*S. Dak. Acad. Sci. Proc., 14 (1928–29, 1931–34), pp. 61–68*).—A summary is given of the progress of studies at the South Dakota Experiment Station on the use of rammed earth for building structures, particularly those used in agricultural production.

Reinforced brickwork, H. D. Williamson (*Rensselaer Polytech. Inst., Engin. and Sci. Ser. No. 46 (1934), pp. 44, figs. 16*).—The results of a series of tests are reported, the purpose of which was to determine what effect the brick themselves may have upon the strength and behavior of reinforced brick structures. Physical studies of the brick included (1) compression tests with brick flatwise, edgewise, and endwise, (2) modulus of rupture tests with brick flatwise and edgewise, and (3) absorption tests in cold water up to 48 hr. and in boiling water for 5 hr. For purposes of design, the elements investigated were (1) the bond between the reinforcing steel and the mortar and (2) the bond between brick and mortar in both tension and shear. Supplementing these tests, small beams were constructed with each series of brick and tested for strength and deformation in order to compare the results from the mortar bond tests and those obtained at larger demonstration structures tested at various brick plants throughout the country.

It was found that there is no direct relation between any of the common physical tests of the brick. Many common brick absorb the major portion of their capacity during the first few minutes of cold immersion.

Surface features of the brick are important where strength of bond is desired. Brick plant dust practically destroys bond strength. The bond strengths of brick may be better indicated in the bond tension test than in the bond shear test for the reason that in the bond shear test with rough surface brick a wedging action occurs. The rate of absorption of brick, either in the first few minutes or during the initial set period of the mortar, is an index for the bond strengths, the lower rates indicating the higher values.

Reinforced brickwork may be designed using the straight-line theory of flexure provided the bond tension, bond shear strengths, and the stress-strain ratio of the brickwork are properly considered. The time required to lay reinforced brick masonry is about the same as that for ordinary masonry of good quality.

No danger from loose brick will result if all mortar joints are carefully constructed. Flat bed joints should be used. Head joints should be full. The importance of exerting a pressure on each joint as the brick are laid should not be overlooked.

Selection of lumber for farm and home building, C. V. Sweet and R. P. A. Johnson (*U. S. Dept. Agr., Forest Serv., Forest Prod. Lab., 1935, pp. [2]+55, figs. 16*).—The purpose of this mimeographed publication is to assist in the estimation of the essential requirements for different building purposes, to show how the different kinds of woods meet these specific requirements, and to emphasize principles that should be followed in good construction. Information is given on classification of woods according to important properties, lumber grades and sizes, standard lumber items usually carried in retail yards, and important points in construction and maintenance.

Report of the Committee on the Mechanical Testing of Timber, J. A. Ewing et al. (*London: Dept. Sci. and Indus. Res., 1934, pp. VI+41, figs. 25*).—The report of the committee relates to the various mechanical tests in common use. A detailed and extensive set of conclusions as to efficiency of the various tests includes also suggestions on improvements. The more important tests considered are tension and compression along and perpendicular to the grain, shearing along the grain, static bending, impact bending, hardness, abrasion, and notched bar impact.

Manual on preservative treatment of wood by pressure, J. D. MacLean (*U. S. Dept. Agr., Misc. Pub. 224* (*1935*), *pp. 124, figs. 35*).—The purpose of this publication is to discuss the application of the results of numerous experiments and observations conducted by the Forest Products Laboratory at commercial treating plants to the improvement of the pressure treatment of wood and to present general information on the subject for use particularly by engineers.

Information is given relating to pressure processes; wood preservatives; effect of wood structure on treatment; moisture content, specific gravity, and air space in wood; preparation of timber for treatment; injecting preservatives; absorption and penetration; effect of treatment on the physical condition of wood; bleeding of treated wood; treating conditions used in commercial practice; and specifications for treatment.

Formulas are given (1) for computing relation of moisture content, specific gravity, and air space in wood, and (2) for computing temperatures in timbers when the temperature of the heating medium, the wood temperature, or both, are different from those in green timbers.

Recent developments in the utilization of soybean oil in paint, W. L. Burlison (*Illinois Sta. Circ. 438* (*1935*), *pp. 8, fig. 1*).—This is an address delivered at the annual meeting of the American Soybean Association, Evansville and La Fayette, Ind., August 21–23, 1935, in which investigations conducted at the station are briefly described.

In these studies paints were tested in which soybean oil constituted varying proportions up to 50 percent of the total vehicle (liquids) used in the paint. Direct comparisons were made with standard linseed oil paints.

The first test panel exposures were made during the spring of 1931 when a large number of panels were put out. The purpose was to study, first, the behavior of paints differing primarily in their content of raw and treated soybean oil and, in addition, to compare the effectiveness of different driers.

After the panels had been exposed for 2 yr. on the rack (set at a 45° angle) it was evident that the type of exposure was exceedingly severe. It was an accelerated test which was probably twice as rapid in getting results as the side of a building or panels exposed upright would have been. It was clear also that the pigment has much to do with the durability of the paints, as might be expected.

Interior paints, as well as exterior ones, were studied. The first of the panels coated with interior paints containing soybean oil were put up in the spring of 1931.

From the exposure and other tests which have been made, the conclusion is drawn that soybean oil has a permanent place in the manufacture of paint. The results on the panels were found to support the findings of other workers to the effect that 30 percent and more of the oil used in the paint can be made up of soybean oil when properly treated and when driers suited to this kind of oil are used.

Alcohol and alcohol-gasoline blends as fuels for automotive engines, I, II, A. L. Teodoro (*Philippine Agr., 24* (*1935*), *Nos. 3, pp. 180–218, figs. 10; 4, pp. 296–325, figs. 14*).—Studies conducted by the College of Agriculture of the University of the Philippines are reported.

I. Performance tests of nearly straight alcohol of different grades using a six-cylinder automobile engine.—In this study 4 fuels were used with updraft carburetors and 8 with downdraft carburetors.

The fuels used with updraft carburetors included (1) an alcohol motor fuel consisting of alcohol 99, gasoline 0.5, and aniline 0.5 percent; (2) dehydrated alcohol consisting of alcohol 99, gasoline 0.5, and aniline 0.5 percent; (3) a special motor fuel consisting of a mixture of 1 part of (2) to 1.21 parts of (1); and (4) gasoline. The fuels used with downdraft carburetors consisted of (1) alcohol motor fuel; (2) alcohol motor fuel consisting of a mixture of 2 parts of alcohol and 1 part dehydrated alcohol; (3) alcohol motor fuel consisting of 1 part dehydrated alcohol and 1 part alcohol; (4) blended fuel consisting of alcohol 60, gasoline 35, and benzol 5 percent; (5) alcohol motor fuel consisting of 1 part dehydrated alcohol to 1.21 parts of alcohol; (6) alcohol motor fuel consisting of 1 part alcohol and 2 parts dehydrated alcohol; (7) dehydrated alcohol; and (8) gasoline.

With the updraft carburetor it was found that the torque and consequently the brake horsepower developed at 2,000 r. p. m. was larger using alcohol motor fuel (1) than with the other fuels. The maximum torque for all fuels appeared at about 800 r. p. m. Fuel consumption of gasoline at three-fourths load was about 8 percent lower than at full load. The results with alcohol fuels showed, however, that the lower the load the higher was the fuel consumption per brake horsepower hour. No difficulty was experienced in starting with alcohol fuels. There was evidence of slight detonation with gasoline at 2,000 r. p. m. on full throttle which was not observed with alcohol. The fuel economy using alcohol motor fuel (1) was reduced about 1.1 percent when the jet was made large enough to develop the same power as gasoline. Engine operation was steadier with alcohol than with gasoline at or near full capacity. The reverse was true at low speeds and very light loads.

In general it was found that approximately the same maximum power was developed at 2,200 r. p. m. with all fuels used with downdraft carburetors, and the maximum torque appeared at about 1,400 r. p. m. with all fuels except the blend. The larger the amount of gasoline present in the mixture the less was the fuel consumption per brake horsepower hour.

It was also found that the lower the specific gravity of the alcohol fuels the less was the consumption per brake horsepower hour. Alcohol fuels had a steadier operation when the mixture used was slightly rich than when lean. Preheating of alcohol fuels when downdraft carburetors were used showed that full preheating shortened the time of warming the engine and decreased the maximum power at higher speeds. Carbon deposit studies showed the largest deposits to be on cylinder heads and piston heads, and that spark plugs had only traces of carbon when alcohol fuel was used. Alcohol fuel produced less carbon than gasoline. No dilution of the crankcase oil was found with alcohol fuels. After 10 hr. of continuous operation the crankcase oil became thicker than the original, this thickening being greatest in the test using dehydrated alcohol. The average ring wear for all cylinders was largest for dehydrated alcohol and smallest for alcohol motor fuel (1).

II. *Performance tests of nearly straight alcohol of different grades using a four-cylinder and an eight-cylinder automobile engine.*—The primary purpose of these studies was to compare alcohol motor fuel, dehydrated alcohol, and gasoline in engines operated with and without preheating under variable speeds and loads at low and high compression.

Tests under low compression showed that higher power was developed with no preheating than with preheating, and that the peaks of the torque curves for all fuels appeared between 1,200 and 1,400 r. p. m. Beyond 1,800 r. p. m. the operation of the engine at higher loads was steadier with alcohol motor fuel than with either dehydrated alcohol or gasoline, especially when the jets used were large enough to admit a slightly rich mixture. The maximum fuel economy was at about 1,500 r. p. m.

Tests under high compression showed that although it was possible to start the engine on gasoline it would not carry any load, and that with a fixed carburetor setting greater power was developed without preheating than with preheating. The peak of the torque curves appeared at about 1,400 r. p. m., and the most economical point was at about 1,700 r. p. m.

It was found further that total ring wear with alcohol fuels using crankcase oil without any upper cylinder lubricant was more than three times the wear using crankcase oil and upper cylinder lubricant.

Approximately 12 percent more carbon accumulated with alcohol motor fuel when using crankcase oil without upper lubricant than when using crankcase oil with upper lubricant. The total carbon deposit was about 17 percent greater for gasoline than for alcohol motor fuel and about 14 percent greater than for dehydrated alcohol.

Tests of these fuels under different speeds and loads showed that the maximum torque between the speeds of about 800 and 1,800 r. p. m. was higher with alcohol fuels than with gasoline by about 2 ft.-lb. Beyond 1,800 r. p. m. the torque of alcohol motor fuel was highest and that of dehydrated alcohol lowest. It was found possible to give the engine a pick-up with alcohol fuels equally as good as with gasoline by keeping the alcohol mixture a little rich.

Antiknock effect of tetraethyllead, J. M. Campbell, F. K. Signaigo, W. G. Lovell, and T. A. Boyd (*Indus. and Engin. Chem., 27 (1935), No. 5, pp. 593–597, figs. 6*).—Quantitative measurements of the specific antiknock effect of tetraethyl lead in 62 individual hydrocarbons were made by finding the increase in critical compression ratio in a single-cylinder variable-compression engine made possible by the addition of tetraethyl lead in a concentration of 1 cc per gallon. Upon this basis there are as many as 20 fold variations in the effectiveness of tetraethyl lead in suppressing knock in different hydrocarbons. Certain general relationships between hydrocarbon structure and susceptibility to lead, which appear to be consistent within the scope of this work, are described.

The data on the effect of tetraethyl lead concentration on the critical compression ratios of a few hydrocarbons show that tetraethyl lead is usually most effective at low concentrations. This characteristic appears, in general, to be most pronounced in the compounds in which the tetraethyl lead is the most effective, and applies to both antiknock and knock-inducing action. It appears that tetraethyl lead exhibits a very wide range of effectiveness in changing the critical compression ratio of pure hydrocarbons, depending upon the structure and properties of the hydrocarbon. In general, the compounds in which lead is more effective appear as those which have a double bond removed from the end of the molecule. As the double bond is progressively moved toward the center of the molecule the effectiveness of lead in the compound increases. The opposite condition seems to prevail for the acetaline compounds, however, and this relationship appears somewhat similar to that observed for the critical compression ratios of these same hydrocarbons. In the case of the olefins with the double bond next to the terminal carbon atom or in the alpha position, the lower members of the series are compounds in which lead is more effective when the measurements are made with the pure compounds.

Electricity on the farm, 1920–1934, compiled by D. W. Graf (*U. S. Dept. Agr., Bur. Agr. Engin., 1935, pp. [20]+110*).—This is a partial mimeographed list of references, classified as to use and with an author index.

Electric heat for propagating benches, J. R. Tavernetti (*Agr. Engin., 16 (1935), No. 9, pp. 353–355, figs. 6*).—In a contribution from the California Experiment Station, data from experiments are presented which may be used to determine the connected electrical load necessary for a propagating bench under different conditions. The experiments were run with dry and wet sand, covered and uncovered, and the data are presented graphically and in tabular form.

Disinfesting soils by electric pasteurization, A. G. Newhall and M. W. Nixon (*[New York] Cornell Sta. Bul. 636 (1935), pp. 20, figs. 10*).—This bulletin reports the results of studies of electricity as a source of heat and of an intensive investigation of two general types of portable electric soil sterilizers. One of these sterilizers employs the soil-resistance principle in which the current passes directly through the soil; the other employs the heating-element principle in which the current passes through resistance heating units properly spaced to impart their heat to the soil by thermal conductance. Both types were found capable of destroying a number of common pathogenes, including bacteria, sclerotial fungi, nematodes, and weed seeds.

Evidence is presented to show that it is not necessary to raise soil temperatures above 70° C. (158° F.) in the presence of adequate soil moisture to kill several common soil pathogenes. All kinds of soils from pure sand to pure muck were effectively treated in both types of pasteurizer. However, in the direct-heating or resistance type it was often necessary to add some dilute electrolyte solution to sand to insure heating in a reasonable time.

In comparison with other standard methods of soil or seed treatment for damping-off control, electric pasteurization appeared to be equal to the best.

The current consumed per cubic foot per degree rise varied with different kinds of soil (22 or 23 w for a pure sand with its comparatively low water content and 27 or 28 for muck with its comparatively high water content). In general, a 50° rise in temperature (from initial 20° to final 70°) required from 1.0 to 1.3 kw.-hr. Where only nematodes and damping-off organisms are being combated, lower final temperatures are permissible, at a saving of current, if more time is employed.

A certain minimum initial-soil-moisture content was found to be very important for most effective operation of both types of pasteurizer. Factors affecting the uniform temperature rise in different parts of the soil mass included uniform distribution of soil moisture, position in the box, degree of packing, insulation, intimacy of contact with electrodes, and speed, or time.

Each type of pasteurizer has its distinct advantages and disadvantages, the sum total of which perhaps favor the second type for general use by the average operator because of its greater safety and simpler operation. So far, attempts to disinfest benches and ground beds with ordinary soil-heating cable have not been successful.

Vertical hitching of farm implements, A. W. Clyde (*Agr. Engin., 16 (1935), No. 9, pp. 358–360, 364, figs. 9*).—Studies conducted at the Pennsylvania Experiment Station on the mechanics of hitching and the forces on implements are reported. These studies were confined to the components of forces in the vertical plane of motion.

It was found that the position and direction of the pulling force are important factors influencing the performance or draft of a farm implement. The forces on implements conform to the common laws of mechanics for equilibrium of forces in space. If certain special cases are omitted and uniform motion is considered the forces may be divided into only three groups, namely, weight, pulling force, and resultant soil resistance.

It was found that the range within which the position and direction of the pulling force can be altered is governed mainly by whether or not the tool has wheels or supports on the soil, the location of such supports, the weight of the tool, and the position of the center of gravity. Advantage may be taken of such manipulation to reduce the slippage of tractor drivewheels, particularly where rubber tires are used in plowing.

It was found further that tools of chisel or wedge shape are different from disks. The former, when properly shaped, usually need to be prevented from penetrating the soil too deep, whereas the latter must be forced into the ground. It was found that the soil reaction on the working face and edge of sharp chisel-shaped tools apparently always has some downward component when the soil is moist.

Properties of lubricating oils, A. P. Henry (*S. Dak. Acad. Sci. Proc., 14 (1928–29, 1931–34)*, pp. *45–47*).—This paper reports studies conducted at South Dakota State College of the relationship between the viscosity of lubricating oils and the dilution of oils with gasoline in internal-combustion engines.

A comparison of new and used oils showed a difference of 265° F. in flash point, which indicates that the gasoline was evidently present in the oil in a fairly large quantity. The fire point of the new oil was 475° and of the used oil 470°, a difference of only 5°.

In testing the viscosity the approved Saybolt viscosimeter was used. The viscosity at 70° showed the greatest difference; the Saybolt number of the new oil was 1929.2, while the used oil number was 862. This indicates about a 5 percent dilution. At 130° the Saybolt number of the new oil was 215.6 and the used oil number 153.4. At 210° the unused oil number was 58.4 and the used oil number 53.2.

In the tests showing the relation between viscosity and dilution of oils it was found that when the mixture contains one part in 16 of gasoline the viscosity is less than half what it is when the sample is pure oil.

Bibliography on combined harvester-threshers, compiled by D. W. Graf (*U. S. Dept. Agr., Bur. Agr. Engin., 1935, pp. 23*).—This is a selected mimeographed list of references covering information from 1841 to 1935.

Removing smut balls from seed wheat, W. M. Hurst, W. R. Humphries, R. W. Leukel, and E. G. Boerner (*U. S. Dept. Agr. Circ. 361 (1935), pp. 16, figs. 6*).—This report represents the results of studies which were conducted cooperatively by the U. S. D. A. Bureaus of Agricultural Engineering, Plant Industry, and Agricultural Economics as to the possibilities of a number of grain-cleaning devices.

It was found that smut balls are usually lighter and, in some cases, smaller than the kernels of wheat in which they are found. Tests made with both experimental and stock farm-sized cleaners showed that wheat may be exposed to air blasts of sufficient intensity and in such manner as to blow out all smut balls from the grain. Some smut balls may also be screened out, but screens are not so effective as air blasts.

Grain cleaners of the fanning-mill type were found to be more effective in removing smut balls from wheat than other types of cleaners on which tests were made. A blast of air when directed upward against a stream of falling grain was found to be more effective in removing smut balls, especially at low air velocities, than when striking the stream at right angles. Generally, the best results in removing smut balls were obtained when the fanning mills were run at considerably less than their rated capacities.

Sweet potato storage houses, E. R. Gross (*New Jersey Stas. Circ. 359 (1935), pp. 4, fig. 1*).—Practical recommendations on the planning and construction of sweetpotato storage houses to meet New Jersey conditions are briefly presented.

Housing the rural worker: Progress of reconditioning in Devon, R. T. Shears (*Jour. Min. Agr. [Gt. Brit.], 42 (1935), No. 6, pp. 542–550, pls. 8*).—The progress of reconditioning of rural dwellings in Devon County, England, is summarized, with particular reference to costs and financing and methods of reconditioning employed. A few reconditioned dwellings are illustrated.

AGRICULTURAL ECONOMICS

[Papers presented at the twenty-fifth annual meeting of the American Farm Economic Association] (*Jour. Farm Econ., 17 (1935), Nos. 2, pp. 211–374, figs. 15; 3, pp. 469–512, 529–574, figs. 2*).—The following papers and discussions thereon in addition to those previously noted (E. S. R., 73, p. 258) are included: Changes in the Aggregate Volume and Distribution of Purchasing Power During Recovery, by O. C. Stine (pp. 211–218): Monetary Policy and Prices, by G. F. Warren and F. A. Pearson (pp. 219–239); Some Results of Governmental Attempts to Foster Recovery, by W. I. King (pp. 240–259); The Farm Mortgage Credit Situation in the United States, by E. C. Young (pp. 260–276); The Short Term Farm Credit Situation in the United States, by E. C. Johnson (pp. 277–289); Farm Debt Adjustments, by H. C. M. Case (pp. 290–306); The Processing Taxes and Some Problems Raised by Them, by M. S. Kendrick (pp. 307–320); The Incidence of the AAA Processing Tax on Hogs, by G. Shepherd (pp. 321–339); The Citrus Marketing Agreements, by A. W. McKay (pp. 340–348); Marketing Agreements for Vegetables and Fruits Other Than Citrus Fruits, by H. R. Wellman (pp. 349–356); Marketing Agreements for Dairy Products, by A. H. Lauterbach (pp. 357–367); The Regulation of the Marketing of Fruits and Other Natural Products in Canada, by W. C. Hopper (pp. 368–374); Appraisal Methods of Federal Land Banks, by P. L. Gaddis (pp. 469–480); Development of the Report of the Appraisal Committee of the National Joint Committee on Rural Credits, by H. Burr (pp. 481–490); Research on Rural Appraisal Problems, by W. G. Murray (pp. 491–500); Agricultural College Courses for Rural Appraisers, by R. R. Hudelson (pp. 501–512); Effect of Agricultural Planning on Farm Management in the Corn Belt, by P. E. Johnston (pp. 529–538); Agricultural Planning and Farm Management in the Cotton Belt, by R. J. Saville (pp. 539–546); Agricultural Planning and Farm Management in the Wheat Belt, by W. E. Grimes (pp. 547–552); Agricultural Planning and Farm Management in the Range Territory, by A. F. Vass (pp. 553–561); Agricultural Planning and Farm Management in the Dairy Regions of the Middle Western States, by G. A. Pond (pp. 562–567); and Agricultural Planning and Farm Management—Dairy Regions, by A. G. Waller (pp. 568–574).

[Papers on agricultural economics] (*Jour. Farm Econ., 17 (1935), No. 3, pp. 409–468, 513–528, figs. 2*).—Included are the following papers: Intensity of Land Use and the Resettlement Problem in Missouri, by C. H. Hammar and J. H. Muntzel (pp. 409–422); Significance of the Ownership Pattern to Land Use Planning, by R. R. Renne (pp. 423–432); Economic Implications of Erosion Control in the Corn Belt, by R. Schickele (pp. 433–448); AAA as a Force in Recovery: Further Considerations, by W. W. Wilcox (pp. 449–458); Freight Rates and Minimum Weight Requirements as Factors in Mixed Carload Shipments of Vegetables from the Lower Rio Grande Valley, by W. E. Paulson (pp. 459–468); Probable Social Effects of Purchasing Submarginal Land in the Great Plains, by P. H. Landis (pp. 513–521); and Acreage Reduction and the Displacement of Farm Labor, by W. Gee (pp. 522–528).

[Investigations in agricultural economics] (*Jour. Farm Econ., 17 (1935), Nos. 2, pp. 375–392, figs. 3; 3, pp. 575–588, fig. 1*).—Notes are included on the following investigations and subjects: Local Government in a Rural Area, by C. J. Bradley (pp. 375–378); Factors Affecting Farm Real Estate Values in the

United States, by F. L. Thomsen (pp. 379–382); Part-Time Farming in the Twin City Area of Minnesota, by L. F. Garey and W. Baldwin (pp. 383–385); The Stepped Price Schedule for Fluid Milk, by A. M. McIsaac (pp. 386–390); Effect of Tax Rates on Land Values, by W. L. Cavert (pp. 391, 392); Competition and Oligopoly, by G. Shepherd (pp. 575–579); The Use of Farm Organization and Budgetary Data as a Basis for Land Valuation, by M. H. Saunderson (pp. 579–583); Contacts of Rural People in Organization Meetings, by M. Oyler (pp. 583–585); Apple Prices in the Annapolis Valley, Nova Scotia, by C. M. Collins (pp. 585–588); and Public Utility Control of Milk in Winnipeg, by H. C. Grant (p. 588).

[Investigations in agricultural economics by the Ohio Station], J. I. Falconer (*Ohio Sta. Bimo. Bul. 176 (1935), pp. 184, 185*).—Tables (1) show the June 1935 price received by Ohio farmers for different farm products and the June parity price of each commodity, and (2) bring the index numbers of production, prices, and income (E. S. R., 74, p. 115) down through June 1935.

Economic phases of erosion control in southern Iowa and northern Missouri, R. Schickele, J. P. Himmel, and R. M. Hurd (*Iowa Sta. Bul. 333 (1935), pp. 185–232, fig. 1*).—From the results of a survey, made in cooperation with the University of Missouri, of the Big Creek watershed, the authors point out that the control of erosion is not a simple problem for the individual farmer but one affected by economic and social forces which are largely beyond his control. Erosion involves more than the mere washing away of the fertile topsoil of farms, since it means also the decline of communities with their schools, churches, and other institutions. Economic and social factors hindering erosion control in this area are small farm size, the corn-hog type of farming, lack of supplementary enterprises, tenancy, short-term leases, crop-share leases, tenant unrelated to landlord, corporate landlord, heavy debt burden and high interest rates, and relatively low farm income level, whereas the converse factors facilitate erosion control. The bulletin attempts to show the relation of these factors to erosion control.

Evidence is presented in support of the view that in the erosive sections of the Corn Belt soil conditions no longer warrant a highly specialized corn-hog type of farming.

A study of the organization and management of potato farms in Aroostook County, Maine, W. E. Schrumpf (*Maine Sta. Bul. 378 (1935), pp. 79, figs. 18*).—This study is based upon information obtained from 165 potato farms in Aroostook County covering 3 yr., beginning April 1, 1928.

The average capital was $28,815 per farm, 84 percent of which was in real estate, 8 in machinery, and 8 percent in livestock, feeds, and supplies. Receipts per farm averaged $4,490 in 1928, $15,912 in 1929, $8,757 in 1930, and $9,720 for the 3-yr. average.

Expenses per farm averaged $7,133 for the 3 yr. The labor income in 1928 was −$3,388 per farm; in 1929, +$7,440; in 1930, −$614; and for the 3-yr. average +$1,146, or 4 percent on the average capital over the 3-yr. period.

The farm acreage averaged 170, 60 percent of which was cropland, 22 woodland not pastured, 13 pasture land, and 5 percent farmsteads, roads, and land partly cleared for cultivation.

The livestock averaged 2.7 cows, 1.5 heifers, 0.2 bull, 0.3 beef animal, 0.7 driving horse, 3.9 work horses, 2 sheep, 2.8 hogs, 29.1 hens, and 0.5 hive of bees per farm. During the 3-yr. period the number of work horses decreased 36 percent, tractors increased 41 percent, and the number of trucks increased 76 percent.

The acres of crops averaged 102 per farm, of which 40.2 percent were potatoes, 22.6 grain, 16.7 mixed hay, 16.6 new-seeded hay, 2.9 green manure crops, and 1 percent other crops.

Potato yields averaged 4,908 bbl. of 2.75 bu. each. The average application of fertilizer to potatoes per acre was 0.9 ton, costing $40. Small farms sustained relatively small losses in the poor year and returned relatively small gains in the good year studied. Large farms, on the other hand, sustained relatively large losses in the poor year and relatively large gains in the good year. Over the 3-yr. period the labor income per farm increased as the size of business increased. Yield rates, work efficiency of man labor and tractive power, and size of business had positive relationships with labor income. Over the 3-yr. period labor income increased as the proportion of receipts from potatoes increased.

Compared with the average of all the farms, the farms 10 or more percent above average in size of business, yield rate of potatoes, and man-labor efficiency had 63 percent more crop acreage, 71 percent more potato acreage, 27 percent more productive-animal units, and 59 percent more capital. They had a yield rate of potatoes 17 percent higher, a crop index 15 points higher, and a value of livestock and livestock products per productive-animal unit 41 percent larger than the all-farm average. On these farms there were 39 percent more acres of potatoes per man, 23 percent more productive-man-work units per man, and 41 percent more acres of potatoes per $100 of tractive power than the all-farm average. These farms had 26 percent less investment in potato machinery per acre of potatoes and required 27 percent less time for gross receipts to equal average capital. The percentage of cash receipts from potatoes on these farms was 5 points higher and the percentage of cropland in potatoes was 3 points higher than the average of all the farms. Compared with the average labor income of $1,146, these farms returned a labor income of $7,034 per farm.

1934 dairy costs and returns on 90 Michigan farms, K. T. WRIGHT, P. F. AYLESWORTH, and E. B. HILL (*Michigan Sta., 1935, M–149, pp. [2]+17, figs. 4; abs. in Michigan Sta. Quart. Bul., 18 (1935), No. 1, pp. 53–56*).—The results of the third year of a dairy cost study are reported. Tables present data as to dairy costs and returns in different areas of the State; costs and returns per 100 lb. of milk, pound of butterfat, and cow (all herds and the 18 low- and the 18 high-cost herds); and the influence of form in which product was sold on costs and returns. The effects of production per cow, feeding efficiency, labor efficiency, breed of cows, value of cows, size of herd, method of milking, etc., and the cumulative effect of such factors are discussed with tables.

1934 tractor costs on 66 Michigan tractors, K. T. WRIGHT and P. F. AYLESWORTH (*Michigan Sta., 1935, M–148, pp. [1]+9, figs. 2; abs. in Michigan Sta. Quart. Bul., 18 (1935), No. 1, pp. 49–53*).—This report is based upon tractor cost records submitted by 63 farmers having 66 tractors. Tables show the annual and hourly costs of operation for different size tractors, by items, the range in hourly costs of two-plow tractors and number of hours used, the use of tractors by operations, relation of tractor used in year to costs and labor efficiency, and size of farm as related to tractor costs and labor efficiency.

RURAL SOCIOLOGY

The social problem of the church in South Dakota, W. F. KUMLIEN (*South Dakota Sta. Bul. 294 (1935), pp. 46, figs. 18*).—Lack of capacity and will to work together in community life is characterized as a serious problem in South Dakota. According to the "norm" of the National Home Mission Council, which is one church to 1,000 people, the State has 3 times too many churches.

The average number of members per church was 133, as compared with 430 on the basis of one church per 1,000 people, 43 percent of whom are church members.

While 52 denominations were operating in the State in 1926, 7 major denominations had 85 percent of the total number of members, 81 percent of the pastors, and 92 percent of the total church membership. The majority of church units are located in open-country hamlets, villages, and small towns. The typical church building for these groups is a small wooden structure, meagerly equipped, holding services once a week, and served by a nonresident pastor.

Among the village, town, and city churches 72 percent of the ministers are resident and 28 percent are nonresident. The open-country churches are served by 7 percent resident ministers, while 93 percent are nonresident.

The average church budget is slightly more than $2,000, but practically one-half of the churches have a budget of less than $1,000 per year.

The average ratio of the Sunday school membership to church membership is considerably below the standard of the National Home Mission Council. The program of the average Sunday school and young people's society tends to be routinized and more or less lifeless.

Since 1926 from 10 to 15 percent of the churches in the State have either become vacant, inactive, or abandoned.

Some progress has been made toward chuch comity, although the work has just begun.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Fundamentals of home economics, M. B. and M. R. Jensen, and M. L. Ziller (*New York: Macmillan Co., 1935, pp. IX+417, figs. 169*).—"This book is designed to present in one volume a series of units from basic home economics subject matter—knowledge, skills, judgments, appreciations, etc., about one's self, one's home, and one's family. It has been designed for the junior high school level with appropriate vocabulary and problems, but should prove useful in any beginning classes in home economics, such as the 1- or 2-yr. home economics courses, or in the first 2 yr. of a 4-yr. high school course. Extra sections in the foods and clothing, e. g., children's clothing, and food values, have been incorporated for the latter."

FOODS—HUMAN NUTRITION

The thirty-ninth report on food products and the twenty-seventh report on drug products, 1934, E. M. Bailey (*Connecticut [New Haven] Sta. Bul. 373 (1935), pp. 485–551*).—In addition to the routine analyses of foods and drugs, this annual report (E. S. R., 72, p. 130) contains a special discussion of the problems in the control of adulterated olive oil, with the recommendations of a joint committee of control officials for the labeling of edible oils to serve as a guide in detecting misbranding.

The report also contains a section on analyses of common foods, which consists of a number of revisions and additions to the data given for common foods in part 1 of Bulletin 286 (E. S. R., 57, p. 591). The table is the same as prepared by the author for a treatise by Joslin (E. S. R., 73, p. 430).

Study of the calcium and phosphorus in cheeses.—The idea of calcium-phosphorus characteristics [trans. title], G. Guittonneau and R. Chevalier

(*Ann. Falsif.*, 28 (*1935*), *No. 316, pp. 198–208*).—This paper describes in detail methods selected as most satisfactory for the determination of calcium and phosphorus in various types of cheese, and presents data on the moisture and fat content, and on the content of calcium and phosphorus expressed as percentage of the whole cheese, of the dry matter, and of the defatted dry matter of three types of soft cheese, Camembert and Brie as types of very soft, Port-Salut of semifirm, and Cantal and Comté of firm paste.

In the fresh state the calcium and phosphorus content of the various cheeses increased with increased firmness of the cheese. On the dry fat-free basis wide differences were found in the calcium and phosphorus content and in the Ca : P ratio. As an illustration, the Comté cheese was 5.5 times as rich in calcium and only 2.1 times as rich in phosphorus as the Camembert cheese. These differences are explained from differences in manufacturing methods. A Ca : P ratio of about 1.5 is considered to indicate a pressed cheese and a Ca : P ratio of 0.5 a cheese obtained by spontaneous draining.

Cereals and seeds inhibit rancidity in lard, S. Musher (*Food Indus.*, 7 (*1935*), *No. 4, pp. 167, 168*).—It has been found possible to overcome the tendency of lard to turn rancid by adding certain crushed or ground seeds or cereals. Data are reported on the stabilizing or antioxygenic effect for lard of raw soybean flour, fully bleached and extracted soybean flour, blanched crushed sesame seed, and oat flour in varying proportions in unfiltered samples and of the residual antioxygenic activity in the lard after filtering.

The protection afforded was found to be proportionate to the amount of the seed or cereal added and to be effective to a considerable extent after the removal of the flour. Soybean flour is recommended in 25 percent concentration for lard used in bread making. The treated lard has the advantage of possessing marked water absorption properties and thus acting as a freshening agent. Blanched crushed sesame seed is recommended for various bakery products because of its sweet and nutty flavor. For other purposes where retention of flavor and antioxygenic activity alone are wanted, a cereal flour, preferably oat flour, is recommended.

The effect of mixing and fermentation upon the protein structure and colloidal properties of doughs, O. Skovholt and C. H. Bailey (*Cereal Chem.*, *12* (*1935*), *No. 4, pp. 307–320, figs. 2*).—In this contribution from the Minnesota Experiment Station attention is called first to the marked alterations in the physical properties of bread doughs which may occur on overtreatment in a high speed mixer. "A firm, dry, coherent, elastic mass may be changed in a few minutes to one having properties of softness, stickiness, and lack of tensile strength to such a degree that it can scarcely be handled without a spoon or spatula." It is also noted that, while properly prepared dried skim milks increase the stability and firmness of bread doughs, dried skim milks prepared with insufficient heat treatment seem to accelerate the physical breakdowns of bread doughs when subjected to extremes of mixing and fermentation.

The report is then given of attempts to obtain additional information concerning the physicochemical changes that occur during the mixing and fermentation of bread doughs by determining the changes in the percentage of primary proteins in normally mixed and fermented doughs, in overmixed doughs, and in doughs containing dried skim milk and fluid skim milk of variable baking quality. Proteases were occasionally added to accelerate the rate of protein decomposition. Tests of physical stability of all of the doughs during mixing were made with the Farinograph for comparison with observed changes in chemical composition.

Nitrogen not precipitated by copper hydroxide or tungstic acid was only slightly increased by excessive mixing or extended fermentation of doughs of ordinary composition, but was increased perceptibly when protease preparations were added to the dough. Certain of the milk samples had a similar effect upon dough properties to that of minute quantities of proteases, but did not produce a similar increase in nonprecipitable nitrogen. The proteins of heated fluid milk and of preheated dried milks were more effectively precipitated by cupric hydroxide or tungstic acid than those to which no heat had been applied.

The authors conclude that "nonprecipitable nitrogen cannot be used as the sole criterion of the hydrolytic or other chemical changes in protein aggregates or molecules in dough. Modifications of the physical properties of dough involving the gluten complex may occur, even though the conventional biochemical methods fail to disclose appreciable quantities of those protein split products which are differentiated by such means."

Free and bound water in bread doughs, O. Skovholt and C. H. Bailey (*Cereal Chem., 12 (1935), No. 4, pp. 321–355, figs. 6*).—In a further attempt to explain the unfavorable changes taking place in bread doughs through overmixing, as noted above, determinations of free and bound water were made by a freezing point method, which is described in detail, on doughs made with three different flours and after modification of plasticity by mechanical mixing.

In replicated determinations of the freezing points of doughs made from each of three flours, each in turn at four sugar levels and after mixing treatments of 1, 2, 3, 4, and 10 min., the calculated bound water values were approximately the same for all of the doughs, amounting to an average of 51.4 percent of the total water present. When allowance was made for the variable amounts of water used in preparing the doughs, the percentages of bound water held by the solids of the different flours (or their hydration capacities) were slightly different, ranging from 42.1 to 45.4 percent per unit weight of dry matter and in the order of the protein content. Two dried skim milks of different baking quality gave similar results in hydration capacities of the doughs in which they were incorporated, the average hydration capacity being 62.1 percent.

Significantly lowered freezing points of all of the doughs resulted from an increase in mixing time. Extensive mixing apparently caused increases in the amounts of reducing sugars sufficient to account for from 13 to 16 percent of the observed decrease in freezing point from doughs mixed for 1 min. to those mixed for 10 min.

It is suggested that "the freeing of soluble fractions and possibly of adsorbed ions by the rearrangements caused by drastic mechanical treatment could cause a change in the electrical charges on the surface of the colloidal components of sufficient magnitude to give rise to the condition known as stickiness or adhesiveness. Such speculations are unsupported, however, except by the observed parallelism of increased solute formation with changes in physical dough characteristics."

A new soybean water bread and the use of soybean meal in the treatment of diabetes and obesity [trans. title], F. Schellong (*Klin. Wchnschr., 14 (1935), No. 14, pp. 487–490, figs. 5*).—A recipe is given for a defatted soybean-meal bread, and data are reported on its use in diabetic and obesity diets.

The biological value of the proteins of white, wheat, and rye breads, R. B. French and H. A. Mattill (*Cereal Chem., 12 (1935), No. 4, pp. 365–371, fig. 1*).—In this study of the biological values of the proteins of white bread, a 50-50 whole-wheat bread, and a 25-75 rye bread, the Mitchell method was followed with young and mature rats, using the bread at a 5-percent protein level.

The biological values obtained with the young animals were white bread 74, whole wheat 73, and rye 66. Corresponding values for mature animals were 83, 80, and 82. The lower and more variable values for the young animals suggest that the broader protein requirement for both growth and maintenance of a growing animal is less well covered than that of an older animal by anything other than a perfect protein.

In metabolism experiments on human subjects with the various breads furnishing 70 percent of the nitrogen, identical biological values (83 in terms of milk 100) were obtained for the proteins of the three types of bread.

The authors conclude that the proteins of bread may be grouped in the same class as meat proteins, and are inferior only to the proteins of the highest biological value such as are contained in milk and eggs.

A study of the availability of bread carbohydrates, E. P. Laug, L. A. Garavelli, and T. P. Nash, Jr. (*Cereal Chem., 12 (1935), No. 4, pp. 356–364, figs. 3*).—"From assays upon phlorhizinized dogs and observations of the reducing substances excreted in the urine of normal dogs after bread feeding, it is concluded that essentially the whole of the noncellulose carbohydrates of white, wheat, and rye breads are available for nutrition. Evidence is offered that the carbohydrates of wheat bread are absorbed more rapidly than are the carbohydrates of white or rye bread. There is some indication that the carbohydrates of rye bread are assimilated less completely than are the carbohydrates of white or wheat breads."

Ten years of peeling and cooking tests of potatoes, C. L. Fitch (*Iowa State Hort. Soc. Rpt., 69 (1934), pp. 351–353*).—From an accumulation of tests conducted for the most part in connection with the annual or district meetings of the Iowa State Horticultural Society, certain conclusions have been drawn as to losses which may be expected in peeling potatoes of different types and as to cooking qualities of different varieties of potatoes.

A 20-percent loss with very good potatoes and careful workers is thought to be about the minimum for hand peeling and a 30-percent loss for mechanical peeling. Losses in peeling machines are especially heavy with long or rough potatoes or with careless use of the machine. The shape of the potato likewise influences the losses in hand peeling, as does the sharpness of the peeling knife. The comment is made that "women do not have the best of peeling knives, do not have good carborundum stones, do not know how to use them, and mostly use dull knives to peel potatoes."

Boiling is considered to be the best method of cooking potatoes for quality tests, as this is the method most commonly used in the home. The special features of different varieties as grown or used in the State are discussed. It is noted in conclusion that dependence cannot be placed upon variety alone, but that tests should be made before potatoes are purchased in quantity.

Composition of miscellaneous tropical and sub-tropical Florida fruits, A. L. Stahl (*Florida Sta. Bul. 283 (1935), pp. 20*).—Based on mature fresh fruits in good marketable condition, the results are presented of analyses of various mango varieties, several forms of citrus, such as limes, lemons, calamondins, and limequats, Japanese persimmon varieties, sapodilla, mamey sapote, cherimoya, sugar-apple, soursop, carambola, papaya, Natal plum, white-sapote, loquat, rose-apple, Java plum, Surinam-cherry, feijoa, Celeste fig, Ischia fig, governor's plum, imbe (mangosteen), pitaya, litchi, mammee apple, ceriman, Barbados gooseberry, yellow Cattley guava, red Cattley guava, common guava, pomegranate, tamarind, and jujube.

Overcoming difficulties in the use of honey, E. F. Phillips (*Food Indus., 7 (1935), No. 2, pp. 61, 104, fig. 1*).—A combination of honey and lactose, with sweet milk incorporated in the sugar mixture by mechanical mixing, has been found to make a fondant of desirable texture, pleasing taste, and good keeping quality.

Home canning by safe methods, J. E. Richardson and H. L. Mayfield (*Montana Sta. Circ. 147 (1935), pp. 19, fig. 1*).—The canning methods given in this circular are based on the joint recommendations of a group of specialists in the State, including research workers and instructors in foods and nutrition, bacteriology, and engineering; extension specialists in home economics; commercial demonstrators; and members from the State board of health and State relief commission.

A brief discussion of measures to prevent spoilage in home-canned foods and of the selection and examination of canning equipment is followed by directions in the form of process charts for the selection and preparation of foods to be canned and for the various standard methods of home canning. Under each method there is a boxed statement giving the class of foods for which the method is considered safe.

Suggestions are given for the storage of canned foods and the detection of spoilage, with emphasis on the dangers of botulinus poisoning. Time tables are given for canning fruits and acid vegetables in the hot-water bath and pressure cooker and nonacid vegetables and meats in the pressure cooker.

Foods that commonly disagree with people, W. C. Alvarez and H. C. Hinshaw (*Jour. Amer. Med. Assoc., 104 (1935), No. 23, pp. 2053–2058*).—This paper discusses the answers given by 500 intelligent or fairly intelligent patients, most of them complaining of gastro-intestinal troubles, to questions concerning foods which they had been forced to give up or which they could eat only with some distress. Some of the tabulated data are from 400 records in which the nature of the disturbance produced by the different foods was noted. Among the disturbances noted were vomiting, diarrhea, or severe pain, gas, flatulence, regurgitation, lingering taste, migraine, and urticaria.

With the exception of wheat, which was mentioned once, the foods complained of were those already incriminated by students of allergy. The total number of complaints registered against each food was greatest for onions, followed by milk, cream or ice cream, apples, and cabbage, all of which had more than 100 complaints. A list of foods seldom mentioned by patients with indigestion and which might well serve as a basis of elimination diets includes lamb, gelatin, butter, sugar, rice, rye, barley, arrowroot, tapioca, sago, lima, soy or string beans, cooked apple, pineapple juice, beets, asparagus, peas, Irish or sweet potatoes, eggplant, turnips, parsnips, pumpkin, artichokes, cooked pears, and weak tea.

Standards for predicting basal metabolism in the immediate pre-adult years, M. E. Stark (*Amer. Jour. Physiol., 111 (1935), No. 3, pp. 630–640*).—Basal metabolism determinations in duplicate are reported on 62 boys from 17 to 20 yr. of age, inclusive, from the University of Wisconsin and the University High School, Madison, Wis. The data are analyzed similarly to corresponding data for girls of the same age group as noted previously (E. S. R., 68, p 855), including the development of prediction equations, and the two series of data are compared with each other for sex differences and with available prediction standards. It was found that the Harris-Benedict adult prediction extrapolated in a straight line for these ages is the most successful for both sexes. No significant gain in prediction accuracy was secured when height and weight were both included in the prediction equations over that using weight alone.

"The present study indicates that within the latter half of the second decade the relationship of metabolism to body size is essentially linear in type, though there is distinctly not a direct simple proportionality between heat production and body weight. An example of abnormal body build illustrates the possibility of grave misconceptions that can arise from the use of a prediction standard that makes the latter assumption."

Child nutrition on a low-priced diet, M. S. Rose and G. M. Borgeson (*Columbia Univ., Teachers Col., Child Devlpmt. Monog. 17 (1935), pp. XIV+109, [pls. 2], figs. [23]*).—This monograph constitutes the detailed report of an investigation noted essentially from a preliminary report (E. S. R., 57, p. 688). The primary purpose of the investigation was to determine the influence upon the health and growth of children of supplementing a low-priced diet with an egg a day. "The researches of the preceding 15 yr. had given milk a place of special prominence as the best single food to serve as the foundation for an adequate diet at all ages; and discoveries with regard to the importance of vegetables as essential supplements to milk had raised the question as to whether the egg had values which would justify teaching those forced to live economically that 'an egg a day' is a good health practice. Some, pointing to the well-known nutritive values of the egg, regarded it as indubitably essential. Others objected strongly to its constant use for fear of constipation and other digestive troubles; still others felt that its cost was too great in proportion to the benefits received to commend it where money must be spent with the greatest care for nutritive return."

Essentially the same conclusions were drawn from the investigation as a whole as were noted in the preliminary report, namely, that it is possible to secure good growth and health in children on a well-chosen low-priced diet without eggs, but that "an egg a day may be regarded as an additional factor of safety." The economical character of the diet is shown by the fact that cereals furnished a median value of 30 percent of the total calories, fruits and vegetables of the cheaper sorts 20 percent, milk 36 percent, fats and sugars 13 percent, and eggs and meat (the most expensive items) only about 3 percent of the diet. The total cost of the diet without eggs averaged about 1.6 ct. per 100 calories at 1923–26 prices.

A nutritional survey of forty-five hundred children on relief, J. C. Geiger and P. S. Barrett (*Amer. Jour. Pub. Health, 25 (1935), No. 2, pp. 183–191, figs. 2*).—The survey reported was conducted in San Francisco at a time when food relief on a commissary basis was changed to a cash basis for a trial period of 6 mo. The children studied had been on the commissary system for periods of from 6 mo. to 2 yr. The plan followed in conducting the survey is described in considerable detail, and data are summarized on the health examination of two age groups, preschool children and 6–16 yr., and on percentages of overweight, normal, and underweight in the same groups. The length-weight index of nutrition, as proposed by Pryor and Stolz, was used throughout. The distribution of deviations from weight for build was compared with those of a control group of public-school children not on relief.

In the school group 11 percent and in the preschool group less than 5 percent of the children on relief were 10 percent or more underweight. Corresponding figures for the control groups were 13 and 8 percent, respectively. From this comparison and the general findings, the authors conclude that "the relief program prior to March 1, 1934, was adequate as far as the nutritional status of the children measured by a length-width index is concerned. The aspect of health education by the physical examination for the discovery of defects was not neglected." The advisability is suggested of conducting a second and third examination at intervals of 6 mo. and of undertaking similar surveys throughout the country, using F. E. R. A. funds.

Hourly variations in weight loss following ingestion of food, C. I. Hovland (*Amer. Jour. Physiol., 111 (1935), No. 2, pp. 448–451, fig. 1*).—In this paper the term weight loss is used in preference to the more common term insensible perspiration. Data are reported on the hourly weight losses recorded on two successive days for 10 subjects following the ingestion of (1) 1 glass of milk

(220 g) and a ham sandwich (350 g) and (2) a heavy lunch consisting of 3 glasses of milk and 3 sandwiches.

After the light meal there was an increase in rate of weight loss for about 2 hr. and then a decline to the base rate at the end of 5 hr. After the heavy meal there was a much greater and more prolonged weight loss, with the rate of loss at the end of 5 hr. nearly 5 percent above the preingestion rate. The maximum increase in weight loss was 10 percent for the light and 23 percent for the heavy meal.

"That the increased rate of loss is principally the effect of food and is not the result of other causes is established by unpublished data of the author for an experiment in which no food was given, and by the results of Benedict and Carpenter [E. S. R., 40, p. 270] in their studies on the effects of food upon metabolism with control periods of fasting. The close correspondence of our results to those obtained on oxygen consumption gives added evidence of the close relationship existing between weight loss and metabolism as measured by the traditional oxygen consumption method."

Weight reduction and high protein diets, L. K. Campbell (*Jour. Lab. and Clin. Med., 20 (1935), No. 8, pp. 843–849*).—Data are reported on weight reduction, basal metabolism, and urinary nitrogen and creatinine values of 27 obese individuals in whom weight reductions of from 1.2 to 6 lb. per week took place on diets of a high protein type containing approximately 2 g protein per kilogram of ideal weight and in most cases with calorie values about 20 percent below basal requirements. A typical diet furnishing 1,510 calories is given.

"The patients maintained excellent health, continued all of their normal activities, and, of course, had increased energy as the weight loss progressed. The large amount of lean meat and vegetables prevented the hunger of which most individuals complain during weight reduction on low protein diets. There were no changes in the kidney function or blood pressure during any period of the observation. Nitrogen balance was maintained at all times."

The effects of diets low in choline, C. H. Best, M. E. Huntsman, E. W. McHenry, and J. H. Ridout (*Jour. Physiol., 84 (1935), No. 2, pp. 38P, 39P, fig. 1*).—In this preliminary report evidence is summarized leading to the conclusion that choline is an accessory food factor.

In normal rats on a diet providing adequate amounts of protein, fat, and carbohydrate (15–20, 20, and 60–65 percent, respectively) and of vitamins A, B_1, B_2, B_4, and D but lacking in choline or substances with similar effect on liver fat, large amounts of neutral fat are said to accumulate in the liver. This fat deposition is completely prevented by choline. On decreasing the fat content of the diet to as low as 3 percent, glycerides still tend to accumulate in the liver and on increasing it to 40 percent very large amounts are rapidly deposited. In these animals gains in weight are significantly less, the mortality rate is higher, and most of the animals have matted and untidy fur.

Hemoglobin production in rats on diets containing bread, V. C. Myers, D. G. Remp, and F. C. Bing (*Cereal Chem., 12 (1935), No. 4, pp. 372–376*).—Iron and copper analyses of white, whole wheat, and rye breads and hemoglobin regenerating tests conducted on rats receiving the breads as supplements to milk and 25 mg of iron daily are summarized as follows:

"Analyses show that some whole-wheat breads contain twice as much iron and copper as white bread. Rye bread contains more copper and iron than white bread but less iron than whole-wheat bread. Feeding experiments show that both the copper and iron of bread can be efficiently utilized by anemic rats for growth and the production of hemoglobin. White bread is a fair source of copper but is a poor source of iron. Whole-wheat bread is not an iron-rich food, although in amounts that might readily be consumed it could supply a significant portion of the daily requirements of normal adults. The iron of whole-wheat bread appears to be equivalent to inorganic iron for hemoglobin production, although only 50 percent of the total is in this form. It is pointed out that differences in the copper intakes of the experimental animals may explain this discrepancy between biological and chemical assays. Further study of the chemical method for the estimation of inorganic iron indicates that nearly all of the iron in bread should be considered inorganic."

The effect of feeding high amounts of soluble iron and aluminum salts, H. J. Deobald and C. A. Elvehjem (*Amer. Jour. Physiol., 111 (1935), No. 1, pp. 118–123, figs. 2*).—In this investigation at the Wisconsin Experiment Station the effect of large amounts of soluble iron or aluminum on phosphorus assimilation was tested on day-old chicks on a normal ration, with observations on growth and on bone formation as determined from the ash content of the tibias at the end of the experimental periods. Blood calcium was also determined.

At an iron level of 0.9 percent or an aluminum level of 0.44 percent, all of the chicks developed severe rickets in 1 or 2 weeks and died within 3 weeks. At all of the levels of iron and aluminum the bone ash was low. At levels equivalent to 50 and 75 percent of the quantity necessary to unite with the total phosphorus in the ration as $FePO_4$ and $AlPO_4$, the bone ash at 3 weeks was reduced to about 25 percent and the blood phosphorus to from 2 to 4 mg per 100 cc. The addition of sodium acid phosphate in quantities sufficient to unite with the added iron or aluminum promoted rapid growth and normal bone formation, with an increase in the blood phosphorus.

From a practical point of view, these observations are considered of significance chiefly as regards the use of very high doses of iron in the treatment of secondary anemia. "Precautions against high ingestion of iron should be made not only in the case of infants but also with adults, because any change in the diet which will reduce the blood phosphorus to levels reported here surely will affect other biological processes in addition to bone formation."

Occurrence, transport, and regulation of calcium, magnesium, and phosphorus in the animal organism, C. L. A. Schmidt and D. M. Greenberg (*Physiol. Rev., 15 (1935), No. 3, pp. 297–434*).—This extensive review of the literature is presented under the headings sources, requirements, and absorption of calcium, magnesium, and phosphorus; fate in the blood stream; physiological and pathological variation in the calcium, magnesium, and inorganic phosphate of the blood; body fluids; calcium, magnesium, and phosphorus in tissues and skeleton; vitamins; the relation of the endocrine glands to the metabolism of calcium, magnesium, and phosphorus; excretion of calcium, magnesium, and phosphorus; calcium, phosphorus, and magnesium balances; and miscellaneous, including egg production and development of the chick embryo and dental aspects. A list of general references and of references to original articles is appended, together with a brief review of publications on the subject appearing since the completion of the original manuscript.

Nutritional significance of vitamin A throughout the life cycle, E. L. Batchelder (*Amer. Jour. Physiol., 109 (1934), No. 3, pp. 430–435, fig. 1*).—Rats were fed from weaning on the Sherman diet B modified by replacing the whole milk powder by skim milk powder plus 8 percent fat consisting of butterfat alone, Crisco alone, and a mixture of the two furnishing 4, 2, 1, and 0.5 percent of butterfat. The experiment was carried on when possible through the rearing of the fourth generation.

Each decrease in the butterfat of the original diet resulted in a distinct decrease in the survival time of the rats of the second generation when placed on a vitamin A-free diet. In each case longer life was accompanied by greater gain before maximum weight was attained.

"A significant difference in the weight of young at 28 days was found between rats on diets containing 4 percent and 2 percent butterfat, in the number of young reared below 2 percent, and of young born below 1 percent butterfat. Rate of growth, duration of reproductive life, and length of life also showed a statistically significant decrease in rats on diets containing less than 1 percent butterfat. Fourth-generation rats were successfully reared on the diets containing 8 percent, 4 percent, and 2 percent butterfat, at which time the reproduction experiments were terminated. Fourth-generation rats were born, but only a small proportion reared, on 1 percent butterfat, and a very few third-generation rats were born but not reared on 0.5 percent butterfat."

On autopsy, puslike material was found at the base of the tongue in 95 percent of the animals which had received the vitamin A-free diet from 28 days to death. About 65 percent of the rats on diets containing 1 percent and 0.5 percent butterfat and about 90 percent of those on the diets containing 8, 4, and 2 percent butterfat had puslike material in the lungs. Urinary calculi were found in the rats on diets very low in vitamin A but not in animals receiving no vitamin A.

"These results indicate that the vitality of rats is affected in various ways by a deficiency of vitamin A, each successive diminution of vitamin A in the diet resulting in increasing evidence of nutritive failure. This study of animals on widely differing amounts of vitamin A in an otherwise adequate (though not optimal) diet emphasizes the fact that our judgment of the adequacy of any diet should be based on as many measures of nutritional success as possible. Only in this way can we be sure that our estimate of necessary amounts meets all needs of the body, including growth, repair, reproduction, lactation, and length of life."

Qualitative blood cell changes in the rat due to vitamin A, P. D. Crimm and D. M. Short (*Amer. Jour. Physiol., 111 (1935), No. 2, pp. 397–405, figs. 3*).—In blood studies on 990 rats, including 369 vitamin A-deficient animals, 148 in various stages of hypervitaminosis A, and 473 litter mate controls, a neutrophil index lag (modified Arneth index) was repeatedly found to be an early manifestation of the cellular changes associated with vitamin A deficiency and a restoration of the normal index to follow administration of the vitamin. The possibility of the effects being due to deficiency of other vitamins was definitely ruled out. The absence of vitamin A was found to inhibit the formation of granulocytic cells but to cause a significant gross decline in the total number of neutrophils. The function of the reticulo-endothelial system to fix and dispose of foreign protein was also shown to be impaired in avitaminosis A, and vitamin A-deficient rats fed desiccated thyroid developed xerophthalmia approximately 11 days earlier than litter-mate controls on the same diet without thyroid.

The specific effect of vitamin A on growth, W. D. Gallup (*Okla. Acad. Sci. Proc. [Okla. Univ.], 14 (1934), pp. 53–56, figs. 2*).—In this study at the Oklahoma Experiment Station a comparison was made of the specific effect of vitamin A on the growth of albino rats when the sources of the vitamin were cod-liver oil and canned tomatoes. The paired feeding method was followed in the determination of unit doses of these materials in order to keep the animals receiving either supplement in the same plane of nutrition as litter mates receiving no vitamin A. After unit doses of each material had been determined, equivalent doses of from 5 to 10 times the unit dose were given of both materials to paired animals.

Unlike earlier studies with calves in which vitamin A in the form of cod-liver oil promoted growth to a much greater extent than the equivalent amount of vitamin A in the form of canned tomatoes, both of these materials in equivalent doses produced approximately equal gains in the growth of rats.

On the absorption and utilization of carotene and vitamin A in choledochocolonostomized vitamin A deficient rats, J. D. GREAVES and C. L. A. SCHMIDT (*Amer. Jour. Physiol., 111 (1935), No. 3, pp. 492–501, fig. 1*).—This and the following paper have been noted essentially from a preliminary report (E. S. R., 71, p. 885).

Choledochocolonostomized and unoperated vitamin A-deficient rats were given carotene orally and by subcutaneous injection and tested at frequent intervals for absorption and utilization of the carotene by the vaginal smear technic for vitamin A. The unoperated animals responded to the carotene administered either orally or subcutaneously within 6 days and about half of them within 4 days, but the operated animals responded only when the carotene was administered subcutaneously in certain concentrations or when administered orally with glycodeoxycholic or deoxycholic acid. These results are thought to indicate that the bile acids function as carriers of carotene across the intestinal tract of the rat. In confirmation of previous work on icteric rats (E. S. R., 64, p. 588), it was also shown that vitamin A when fed orally is absorbed in sufficient amounts by the internal bile fistula rat to correct the vaginal smear picture.

The utilization of carotene by jaundiced and phosphorus treated vitamin A deficient rats, J. D. GREAVES and C. L. A. SCHMIDT (*Amer. Jour. Physiol., 111 (1935), No. 3, pp. 502–506*).—Following similar methods to those in the above-noted study, it was demonstrated that irrespective of the method of administering carotene to vitamin A-deficient icteric rats little or no conversion of the carotene into vitamin A takes place. The treatment of vitamin A-deficient rats with phosphorus led to a decreased ability to transform carotene into vitamin A.

"While the evidence is not directly conclusive, the experiments point to the possibility that the liver is the organ in which carotene is chiefly converted to vitamin A."

The treatment of exophthalmic goiter with large doses of vitamin A (Vogan) [trans. title], H. WENDT (*München. Med. Wchnschr., 82 (1935), No. 29, pp. 1160–1162*).—In three cases of exophthalmic goiter, treatment with massive doses (30 drops three times a day) of the vitamin A concentrate Vogan was followed by a marked increase in weight and lowering of basal metabolism to normal values.

Vitamin B (B_1) in bread as affected by baking, A. F. MORGAN and H. FREDERICK (*Cereal Chem., 12 (1935), No. 4, pp. 390–401*).—This investigation was undertaken to answer several questions concerning various types of bread as sources of vitamin B (B_1). The breads tested were made for the most part according to formulas suggested by the American Association of Cereal Chemists and included whole wheat, white, part whole wheat (½ or ⅓), whole rye, part rye (⅓), a white flour raisin bread, a bread made with the same ingredients without the raisins, and a milk bread. The vitamin values were determined both by the Chase and Sherman method with young rats (E. S. R., 66, p. 410) and the Salmon method with adult pigeons (E. S. R., 57, p. 594). The international standard vitamin B_1 adsorbate was used with a reference group. Animals given 10 mg daily of the standard grew at an average rate of 34 g in 8 weeks.

The whole wheat, rye, and white breads tested were found to contain from 98 to 180, 84, and 30 international units per 100 g, respectively, or from 40 to

53, 34, and 12 Sherman units per ounce of fresh bread. Practically no loss of the vitamin occurred during baking at temperatures ranging from 350° to 446° F. The content of vitamin B_1 was slightly higher in the 1½-lb. loaves than in the 1-lb. loaves and considerably higher in the crumb than in the crust. The addition of 20 percent of wheat germ nearly trebled the vitamin B_1 value of the bread, but produced a loaf of somewhat smaller volume, poor texture, and yellow color. "Addition of raisins, 65 percent of the flour weight, increased the vitamin value of the bread about 25 percent, but the usual 4 percent skim milk powder addition did not change the vitamin B_1 content of white bread. Bread sold as 'milk bread' was likewise found to be the same as ordinary white bread in this regard."

The vitamin B (B_1) and G (B_2) content of wheat products, A. F. Morgan and M. J. Hunt (*Cereal Chem., 12 (1935), No. 4, pp. 411–418*).—Using the same methods for vitamin B_1 as in the study noted above and a potent rice polish concentrate prepared by the method of Evans and Lepkovsky (E. S. R., 65, p. 613) as the source of vitamin B_1 in the vitamin G tests, the authors have determined the vitamin B_1 and B_2 values of samples of whole wheat, wheat germ, and of whole wheat supplemented with 10 and 20 percent of wheat germ.

The data summarized in international and Sherman units for vitamin B and Sherman units for vitamin G are as follows: Whole wheat No. 1, 125, 170, and 100 units, respectively; wheat germ No. 1, 758, 1,032, and 404; and whole wheat No. 1 with 20 percent wheat germ (wheat hearts), 242, 329, and 124, respectively. A trade preparation of wheat germ, Bemax, was found to contain 860 international or 1,170 Sherman units of vitamin B per 100 g.

Presence of vitamin B complex in cassava root [trans. title], F. A. de Moura Campos (*Ann. Faculd. Med. Univ. São Paulo, 11 (1935), No. 1, pp. 27–31, figs. 2*).—Scraped fresh root of cassava gave good growth as a supplement to Hawks-Bergeim vitamin B- (complex) free diet. Less satisfactory growth but prevention of pathological symptoms in 80 percent of the cases occurred with dry manioc or cassava meal.

A fungus test for vitamin B_1 [trans. title], W. H. Schopfer (*Ztschr. Vitaminforsch., 4 (1935), No. 1, pp. 67–75, figs. 3; Ger., Eng. abs., p. 75*).—A fungus of the family Mucoraceae (*Phycomyces blakesleeanus*), which will not thrive on an artificial medium, has been found to be extremely sensitive toward vitamin B_1, 0.00005γ per cubic centimeter of the medium being sufficient to promote growth. The micro-organism is proposed for use as a very delicate test for vitamin B_1.

Experimental avitaminosis B [trans. title], C. and F. A. de Moura Campos and W. E. Maffei (*Ann. Faculd. Med. Univ. São Paulo, 11 (1935), No. 1, pp. 9–26, pl. 1, figs. 4*).—Pathological symptoms and histological findings in various tissues of rats on a vitamin B_1-free diet are described. No evidence was obtained of destruction of the myelin sheath.

The vitamin C content of breast milk [trans. title], W. Neuweiler (*Ztschr. Vitaminforsch., 4 (1935), No. 1, pp. 39–54, fig. 1; Fr., Eng. abs., pp. 52, 54*).—In the studies reported the samples of milk were centrifuged and 9 cc of the centrifugate was treated with 1 cc of a buffer solution containing 1 percent acetic acid and 50 percent sodium acetate to a pH about 6.21, and 5 cc of 2,6-dichlorophenolindophenol solution was titrated with the milk as thus prepared.

The ascorbic acid content of the samples tested ranged from 0.6 to 11.4 mg percent, with an average of from 4 to 7 mg percent. From these figures breast milk is considered to be from 5 to 6 times as rich in vitamin C as cow's milk, one-tenth as rich as lemon juice, and one-twentieth as rich as adrenal gland. Human colostrum contained no more vitamin C than early or late milk. The content of the vitamin is determined by the food supply. Good agreement was secured between titrimetric and biological estimations.

The effect of vitamin D on the calcium content of the dentine, E. W. Fish (*Jour. Physiol., 84 (1935), No. 3, pp. 272–278*).—This report records unsuccessful attempts to alter the calcium content of the dentine of the teeth of dogs by heavy doses of vitamin D and calcium over extended periods.

"Analyses of the dentine showed no change in its calcium content. Skiagrams of the bones showed an increase in their capacity to X-rays, and histologically there appeared to be new deposits of highly calcified bone matrix, but there were no apparent changes in the other tissues examined. The blood calcium was markedly increased."

The vitamin D content of cholesterol-containing bases for salves.—I, Absorption through the alimentary mucosa. II, Absorption through the skin [trans. title], A. St. v. Mallinckrodt-Haupt (*Ztschr. Vitaminforsch., 4 (1935), No. 1, pp. 1–39, figs. 6; Fr., Eng. abs., pp. 38, 39*).—Various cholesterol-containing ointments after irradiation contained vitamin D which could be absorbed by the mucous membrane or, to a lesser degree, by the skin. It is thought that relatively large amounts of these activated ointments can be taken without harm.

Can Azotobacter chroococcum synthesize vitamin D? J. E. Greaves (*Jour. Bact., 30 (1935), No. 2, pp. 143–148*).—In this contribution from the Utah Experiment Station, evidence is presented leading to the conclusion that *A. chroococcum* when on synthetic media of inorganic salts and mannitol synthesizes the precursor of vitamin D, which is readily transformed into vitamin D by irradiation. It is noted that this finding places this microorganism in the group with *Clostridium butyricum*, *Staphylococcus albus*, and the higher plants in being able to synthesize ergosterol but unable to synthesize vitamin D, and differentiates it from *Mycobacterium tuberculosis*, *Bacterium coli*, and *Corynebacterium* which contain neither sterol nor vitamin D.

Diseases of metabolism and nutrition: Review of certain recent contributions, R. M. Wilder and D. L. Wilbur (*Arch. Int. Med., 55 (1935), No. 2, pp. 304–343*).—The topics included under "progress in the study of metabolism" in this critical review of the literature are hormones of the pituitary and suprarenal bodies in the metabolism of carbohydrate, heredity in diabetes, the symposium on metabolism of the New York Academy of Medicine (E. S. R., 72, p. 890), factors influencing the activity of insulin, exercise and the blood sugar level, and purine metabolism and gout. Under "progress in the study of nutrition" the topics include vitamins and minerals, the relation of the nutritive state to infection, and significance of the gastro-intestinal tract in nutritional states. The 114 references to the literature are given as footnotes.

Food handlers and the epidemiology of amebiasis, H. G. Johnstone and M. K. Iverson (*Amer. Jour. Trop. Med., 15 (1935), No. 2, pp. 197–207*).—This paper reports the results of an examination for *Endamoeba histolytica* infections of the complete food handling personnel of 1 hospital, 1 health home, 4 large hotels, 4 clubs, and 4 cafeterias in San Francisco, comprising a total of 747 individuals of whom 22 were found to be infected. The low incidence of *E. histolytica* was found to be accompanied by a low incidence of the other concomitant protozoan infections.

The individual members giving positive tests in 2 families are noted to illustrate the fact that once an infection of *E. histolytica* is introduced into a home it tends to spread to other members of the family. The relative importance of the food handler as a carrier to other probable sources of infection and methods of transmission is discussed, with the following comment:

"The routine examination of all food handlers is impractical, but additional surveys in various types of eating places should be made to determine the importance of food handlers in spreading amebiasis and to establish their comparative danger in respect to other modes of transmission. An educational campaign pertaining to food handlers should be instituted."

The spleen, hemoglobin, and erythrocytes in nutritional anemia of the rat, C. J. Hamre and C. D. Miller (*Amer. Jour. Physiol., 111 (1935), No. 3, pp. 578–589, pl. 1*).—The investigation reported in this contribution from the Hawaii Experiment Station was occasioned by the discovery in the routine testing of foods for hemoglobin regenerating value that the spleens of rats fed supplements with poor hemoglobin regenerating properties showed on autopsy marked enlargement, while those of animals showing complete recovery of hemoglobin were of normal size.

Gross and histological studies of the spleens of rats in different stages of nutritional anemia and after cure showed that in severe nutritional anemia the spleen is disorganized and to some extent degenerated and is not active in the production of blood elements. During the period of recovery from the anemia following the administration of adequate quantities of iron and copper either in the form of inorganic salts or in natural foods, the spleen enlarges temporarily and is actively erythropoietic. When iron is fed without copper as a supplement to milk there is no enlargement of the spleen or increase in erythrocytes, but when copper is fed without iron the spleen enlarges and an active erythropoiesis occurs, accompanied by a recovery of erythrocytes but not a complete recovery of hemoglobin.

"We suggest on the basis of our observations that the hematopoietic processes and functions of the spleen of young animals are suppressed by an exclusive diet of milk, and that these processes and functions are resumed when adequate diets are supplied. On the basis of the experiments here reported an 'adequate diet' for the normal functioning of the spleen is one that supplies sufficient copper and possibly iron, either in inorganic form or in food combinations. Additional, carefully controlled experiments may demonstrate that of the two elements, copper alone is concerned in the cytogenic function of the spleen."

The blacktongue-preventive value of 7 foodstuffs, W. H. Sebrell, G. A. Wheeler, and D. J. Hunt (*Pub. Health Rpts.* [*U. S.*], *50 (1935), No. 39, pp. 1333–1341*).—The experiments reported are a continuation of the studies undertaken by the U. S. Public Health Service to determine the relative pellagra-preventive value of foods commonly used in American diets (E. S. R., 71, p. 733). In the present study, as in some of the earlier ones (E. S. R., 60, p. 793), the experiments were carried out on dogs on the assumption that the pellagra-preventive and blacktongue-preventive factors are identical.

Of the materials tested, rabbit meat, lean pork shoulder, and canned chicken are considered good sources, cottonseed meal a relatively poor source, evaporated peaches a fair source, and prunes and canned beets a negligible source of the pellagra-preventive vitamin.

The influence of salts of magnesium in experimental rickets [trans. title], F. Rogozinski and Z. Glowczynski (*Bul. Soc. Chim. Biol., 17 (1935), No. 1, pp. 88–95*).—On diets rich in calcium and phosphorus and with a favorable calcium: phosphorus ratio, magnesium even in great excess had no effect on the growth or mineralization of the bones of rats. In a typical phosphorus-deficient rickets-producing diet an excess of magnesium prevented growth and did not alter the ash content of the bones. The influence of excess magnesium is thought to depend upon the ratio between the three elements phosphorus, calcium, and magnesium.

The effect of phosphates on the bones of rachitic rats, C. A. Lilly, C. B. Peirce, and R. L. Grant (*Jour. Nutr., 9 (1935), No. 1, pp. 25–35, pls. 3*).—The addition of phosphates to a high calcium, low phosphorus rachitic diet for rats caused X-ray, chemical, and histological evidences of healing equal to that caused by viosterol.

TEXTILES AND CLOTHING

Silver Jubilee Conference Number (*Jour. Textile Inst., 26 (1935), No. 7, pp. P113–P306, T211–T236, figs. 92*).—Papers presented at the Silver Jubilee Conference of the Textile Institute in Ilkley, England, June 12–14, 1935, included Pneumatic Appliances and the Textile Industry, by A. H. Milnes (pp. P113–P132); Flax Fibre Characteristics: Their Bearing on the Production and Properties of Wet Spun Yarns, by S. A. G. Caldwell (pp. P133–P146); Developments in the Twisting and Doubling of Plain and Fancy Yarns, by W. Bailey (pp. P147–P164); The Effect of Quality and Fibre Length on the Strength of Single Worsted Yarns, by G. R. Stanbury (pp. P165–P176); "Fibro" for Crêpe or Other Fancy Yarns, by H. Ashton (pp. P177–P188); Changes and Developments in the Production of Yarn Packages, by H. Nisbet (pp. P189–P200); The Boiling of Dry-Spun Flax Yarns, by H. A. Elkin (pp. P201–P214); Cotton Fibre Control with Special Reference to High Drafting Methods, by H. Bromiley (pp. P215–P246); The Production of Spun Silk Yarns, by L. Armitage (pp. P247–P262); The Effect of Single and Folded Twists on the Strength of Two-Fold Worsted Yarns, by S. Kershaw (pp. P263–P270); The Oiling of Wool, by J. B. Speakman and J. R. Greenwood (pp. P271–P288); and Investigations Regarding the Tension of Cotton Yarns During Pirning and Coning, by W. Reiners (pp. P289–P306). An article on the Mechanical Testing of the Suitability of Fabrics for Shoe Linings, by R. S. Edwards (pp. T221–T225), and the paper abstracted below (pp. T226–T236) are also included.

Effect of storage prior to ginning on the spinning quality of cotton, N. Ahmad (*Jour. Textile Inst., 26 (1935), No. 7, pp. T226–T236*).—Storage of seed cotton for 4 weeks before ginning, at the Technological Laboratory at Bombay, had no effect upon mean fiber length or fiber weight per inch, contrary to the view that fiber development continues after picking during storage of seed cotton. Wax determinations did not confirm the view that oil diffuses from the seed into the fiber during storage. Yarn spun from Punjab-American 289F cotton stored 4 weeks before ginning was stronger and more even than that from the early ginned sample of the same variety, but the other cottons tested, P.-A. 4F and Mollisoni, usually gave similar results for the 2 types of samples. Precautions to be taken if seed cotton must be stored for some time before ginning are outlined.

MISCELLANEOUS

Twenty-five years of research (*New Hampshire Sta. Bul. 287 (1935), pp. 23, figs. 37*).—This bulletin epitomizes some of the major activities of the station under the headings of the soil and its crops, measuring animal digestion, the program behind apples, why potatoes are coming back, the poultry industry shifts into high, war to the death—against insect pests, economics comes to the fore, research goes into the forest, and lighting up a State.

Annual report of the director [of Puerto Rico College Station] for the year 1933–34, F. A. López Domínguez et al. (*Puerto Rico Col. Sta. Rpt. 1934, pp. 202*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

NOTES

Colorado College and Station.—Dr. Louis G. Carpenter, professor of engineering and physics from 1888 to 1911 and director of the station and irrigation engineer from 1899 to 1910, died in Denver September 12 at the age of 74 yr. A native of Michigan, he was graduated from the Michigan College in 1879, receiving the M. S. degree in 1883 and the honorary degree of doctor of engineering in 1927 from the same institution and serving therein from 1881 to 1888 as instructor and assistant professor in mathematics. He was especially known for his work in irrigation engineering, serving as State engineer of Colorado and as expert in irrigation for the U. S. Department of Agriculture and in later years devoting himself to this field commercially. He was a member of a large number of professional societies, and had been president of the American Society of Irrigation Engineers and in 1900 a vice president of the American Association of Agricultural Colleges and Experiment Stations.

Massachusetts Station.—Dr. A. B. Beaumont, formerly research professor of agronomy, has been appointed in charge of soil reclassification for the States of Texas and Oklahoma under the U. S. Resettlement Administration.

Mississippi College and Station.—John S. Carroll, identified with the chemical work of the institution from 1894 to 1904 and again during the war period, mainly as assistant professor of chemistry and assistant State chemist, died September 15 at Jackson. He was born in 1871, reared on a farm, and received from the college the B. S. degree in 1892 and the M. S. degree in 1896. Since 1904 he had been associated with commercial potash interests.

Dr. E. W. Sheets has been appointed professor of animal husbandry in the college and chief of the animal husbandry department of the station and will serve as chairman of the animal industry group in coordination and research work.

Missouri University and Station.—A 2-yr. preforestry course is to be offered at the beginning of the second semester. This work and also investigations which are to be instituted will be in charge of R. H. Westveld, assistant professor and research assistant in forestry in the Michigan College and Station, who has been appointed assistant professor of forestry in the department of horticulture.

North Dakota Station.—H. E. Ratcliffe, assistant professor of agricultural economics and assistant farm economist, has resigned and has been succeeded by Willard O. Brown.

South Carolina College and Station.—The Federal Public Works Administration has recently approved a project providing for the construction of an agricultural building and a student dormitory costing $400,000 each. The agricultural building will be a U-shaped structure, three stories with basement, and will provide office, classrooms, and laboratory space for the school of agriculture and the station.

A modern dairy barn has just been completed at a cost of $40,000, replacing the one burned in March, 1935. Milking and milk handling equipment has been installed which make the plant among the most modern in the southeast.

Recent additions to the staff include Dr. J. B. Edmond, associate horticulturist; R. L. Smith, assistant agronomist; and O. B. Garrison, assistant to the director.

EXPERIMENT STATION RECORD

VOL. 74 MARCH 1936 No. 3

RESEARCH AS VISUALIZED IN THE 1935 REPORT OF THE SECRETARY OF AGRICULTURE

"The principal function of this Department is scientific research. All its other activities, such as weather and crop reporting, the eradication or control of plant and animal diseases and pests, the administration of regulatory laws, highway construction, and economic guidance, are the practical expression of research results. Research is the primary thing, the keystone of the entire structure of the Department's functions and services."

This appreciative utterance opens a somewhat extended discussion of research by the Secretary of Agriculture in his recent report for 1935. He goes on to say that naturally the Department does not rely exclusively on the findings of its own investigators, but, on the contrary, draws upon the general fund of scientific knowledge as it increases throughout the world. This condition, however, intensifies rather than diminishes the interest of the Department in research and gives special application to a major theme of his remarks—the need of effective coordination. "Single discoveries in science," he points out, "form part of a mosaic or pattern, the design of which is quite as important as the separate discoveries. Science is a living thing fashioned of many elements, each standing in a dynamic relationship to the whole and having no meaning apart from its place in the pattern. After the analysis of problems, by separate study, there must be a synthesis of the results, a synthesis which tends to grow wider and more comprehensive as the need develops for conceiving the application in terms of social welfare."

Research in the Department and in the State experiment stations, the Secretary states, has been conducted for many years with increasing recognition of this principle, and has developed structurally and functionally in adaptation to a continually changing environment. Among the difficulties within the Department which, in his opinion, have tended to hamper free and full coordination of projects and to discourage certain basic studies has been " the allocation of research funds, item by item, on a bureau basis, for objects sharply particu-

larized." *A somewhat similar difficulty has also been encountered by many of the experiment stations because of the frequent practice of* "earmarking" State appropriations. Under this system, the Department's research "has been developed largely to meet emergencies, to throw up quick defenses against animal and plant pests and diseases, to solve specific economic questions, or to develop varieties or strains of plants and livestock suited to particular conditions. Research of this type, for objects well defined in advance, is extremely valuable, and will always be necessary. But it is not the only type of research which agriculture needs. In fact, such research is in the nature of superstructure. It needs much more foundation research to establish laws and principles. Science is exploration and should not be confined to territory that can be mapped in advance. One might as well equip an exploration party and forbid it to break new ground."

As a step toward remedying this situation, the report then goes on to discuss the special provision afforded by the Bankhead-Jones Act (E. S. R., 73, p. 289) for "research into laws and principles underlying basic problems of agriculture in its broadest aspects." Not only are considerable funds made available for assignment by the Secretary for such research, but "another advantage of the new law is the flexibility it authorizes in research procedure." Although generally the method of itemized appropriations which has been followed works well, since "research projects do not need to be changed very often," more than a year must pass after research plans are made before the funds become available and another delay may occur if circumstances necessitate a change of plans. "This lack of elasticity in the shaping of research programs sometimes frustrates their purpose. . . . Henceforth it will be easier for the Department to meet such exigencies."

Besides authorizing additional basic research, the new law provides for research regarding the production, distribution, and consumption of agricultural commodities. "In other words, it authorizes the study of essential elements in farm adjustment. This is largely a problem in the coordination of research procedures and research findings, a task necessarily difficult under the itemized project method whereby different governmental bureaus with separate funds and separate projects operate more or less independently. The new legislation affords the Secretary greater opportunity to organize a joint attack on this and similar problems—to bring the soil chemist, the agronomist, the animal and dairy husbandman, the agricultural engineer, and the economist into a more effective collaboration on problems within the scope of the act."

Secretary Wallace concludes that in appropriating funds for basic research, in addition to funds for the study of highly specific problems, Congress has recognized that fundamental research may often be more practical than short-cut research. As an example of the many instances in which history abounds, he cites the early attempts of experimenters to control certain potato diseases by changing the time of planting the crop, by trying to keep the seed from "running out", and by adopting special methods of cultivation and fertilization. Ultimately fundamental research proved that filtrable viruses could cause disease in plants, and this discovery furnished the basic knowledge for permanent solutions of the problems of many diseases, not only in potatoes and other plants but in animals and man.

Likewise, "certain fundamental studies at agricultural experiment stations and elsewhere have disclosed some of the effects of rations derived from various plant sources and have led to exact knowledge about vitamins. This in turn answered many specific farm problems, such as the real difference in feeding values of white and yellow corn, the value of pasturing livestock, the value of well-cured hay, and other problems which had been perplexing investigators."

On the other hand, the Secretary makes clear that fragmentary and piecemeal research on problems which are essentially basic almost necessarily yields disappointing results. "Plant breeders, for example, may develop a sugarcane that resists mosaic disease only to find that the new strain falls an easy prey to diseases that the older varieties resist. It is obviously necessary to study the fundamental nature of resistance to disease. Entomologists, under the pressure of emergency demands, may try to discover an insecticide that will kill a particular moth and save a particular crop, and the effort may be worth-while. It may be still more important, however, to reveal the habits and physiology of insects in general, so that the control problem can be dealt with broadly as it applies to many insect pests. Fundamental chemical research on the properties of insecticides may solve many insect-control problems simultaneously. Research for limited so-called practical objects often fails until scientists widen the scope of their inquiry to include the basic elements involved and so reveal the governing laws."

Among the basic problems for which further study is suggested are those involving the so-called "trace elements", the role of enzymes, the photosynthesis of plant substances, long-range weather forecasting, and additional research in genetics and related fields, particularly in regard to the nature and inheritance of animal characters of economic value. In most of these fields coordination of the various studies will doubtless be essential, and it is therefore a matter for congratulation that such coordination should be greatly facilitated under the new law.

As to the organization of basic research, a note of caution appears in the report regarding the need of setting up reasonably attainable objectives. "The fact that we glimpse a big problem," Secretary Wallace makes plain, "is not in itself a sufficient warrant for spending time and money in an effort to solve it. There should be a fair chance of progress. Authority for this Department to conduct research without being required to tell in detail what it expects to find does not justify aimless wandering or imply that a sense of direction is unnecessary. Fundamental research need not be less practical than research for concrete specified advantages, though we may be unable to foresee just where it will lead. The analogy with geographical exploration is apt. Explorers do not strike out into a void but into territory which they want to know better. Similarly, the scientific investigator has a general idea of the continent he wishes to map, and perhaps also a rough notion as to its main contours. He may not move straight to a defined objective; but the method of fundamental research is not impractical merely because it may be indirect."

Largely for reasons which have already been set forth, in the past the endowed scientific institutions such as the great foundations and some of the universities have been freer to conduct fundamental research than have public agencies. Now an enlarged and enlarging opportunity is at hand. As the report states, "increased fundamental research in the Federal and State agencies is timely and in full accord with the principle that these public institutions should be prepared to keep our basic knowledge abreast of our need in meeting definite human problems."

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Yearbook for agricultural chemistry [trans. title], edited by F. MACH (*Jahresber. Agr. Chem., 4. ser., 14 (1931), pp. XXXVI+565*).—This is a collection of summaries of current work prepared by many authors and assembled by editors of specific sections and subsections. The main divisions are (1) plant production, edited by G. Claus, R. Herrmann, W. Lepper, F. Sindlinger, A. Stählin, and W. Wöhlbier; (2) animal production, edited by J. Brüggemann, M. Kling, and A. Schütz; (3) industries related to agriculture, and fermentation phenomena, edited by R. Herrmann, F. Mach, E. Pommer, and C. Schätzlein; and (4) investigational methods, edited by R. Herrmann, M. Kling, W. Lepper, F. Mach, E. Pommer, A. Schütz, and F. Sindlinger.

The chemistry of cement and concrete, F. M. LEA and C. H. DESCH (*New York: Longmans, Green & Co.; London: Edward Arnold & Co., 1935, pp. XII+429, pls. 10, figs. 80*).—This book gives, with the practical viewpoint always kept in mind, " a general survey of the chemistry of cement and concrete, interpreting this title in a broad sense. It is intended for the chemist and also for the engineer or architect who has to deal with cement and concrete."

Occurrence of selenium in pyrites, K. T. WILLIAMS and H. G. BYERS (*Indus. and Engin. Chem., Analyt. Ed., 6 (1934), No. 4, pp. 296, 297*).—The authors of this contribution from the U. S. D. A. Bureau of Chemistry and Soils conclude, from the figures here given and from a large quantity of unpublished data on file at the Bureau, that " in arid and semiarid areas the presence of selenium is to be expected in every case where the sulfur content of the soil parent material is high, and that, where the selenium content permits, the derived soils and their vegetation may contain sufficient selenium to render them potentially dangerous," although the mere presence of selenium in soil is not necessarily to be considered, per se, an indication of an inferior soil. " It also seems probable that soils produced in humid areas are not likely to have a pernicious selenium content even though the parent materials are relatively rich in this element." The possibility of selenium contamination is to be taken into consideration, especially in the case of soils to be utilized under irrigation.

The salting-out of amino-acids from protein hydrolysates.—I, The isolation of tyrosine, leucine, and methionine, E. M. HILL and W. ROBSON (*Biochem. Jour., 28 (1934), No. 3, pp. 1008–1013, figs. 2*).—After an hydrolysis of casein with hydrochloric acid and the usual removal of excess acid by concentration under reduced pressure, the final residue from the hydrolysis of 1 kg of casein was dissolved in 4 l of boiling water, brought to pH 2.4 by additions of 40 percent sodium hydroxide, and decolorized with charcoal. The filtrate and washings were cooled overnight, and the crystallized tyrosine was filtered off.

To precipitate leucine and methionine, the filtrate from the tyrosine was further neutralized to pH 6.0 and evaporated under reduced pressure until sodium chloride began to separate. After cooling the sodium chloride settled, and the precipitated amino acids floated, for the most part, near the surface. The amino acid suspension was decanted onto a filter, drained as dry as possible by suction, and washed with a saturated solution of the precipitated sodium chloride. From a suitable solution of the mixed precipitate of amino acids, the methionine was precipitated by means of mercuric acetate and separated from its mercury compound by removing the mercury as sulfide.

Leucine was separated by treating the filtrate from the mercuric acetate precipitation of methionine with hydrogen sulfide, concentrating the filtrate and washings from the mercuric sulfide to a small volume, and adjusting to pH 6.0, when the leucine began to crystallize at once.

The entire procedure, including the purification of the separated individual amino acids, is given in working detail.

Fermentation of sugar by the root nodule bacteria, A. I. VIRTANEN, M. NORDLUND, and E. HOLLO (*Biochem. Jour., 28 (1934), No. 3, pp. 796–802*).—As the result of an investigation of the fermentation of glucose by the root nodule bacteria, in which heavy suspensions of *Rhizobium trifolii* were grown separately on a pea-extract gelatin medium, the authors find that the fermentation is of the butyric type. During the early stages of the process considerable amounts of *dl*-lactic acid were formed from glucose. Lactic acid was slowly fermented further, however, with the production of butyric acid, one of the end products. In addition to lactic and butyric acids, carbon dioxide, hydrogen, and small quantities of acetic acid and ethyl alcohol were also formed. The molecular ratio of butyric acid to carbon dioxide and hydrogen was $C_4H_8O_2:CO_2:H_2=1:2:2$. A similar fermentation of glucose was also caused by crushed nodules from plants grown in sterile quartz sand cultures.

An aqueous extract of mold mycelium was found to stimulate markedly the growth of *R. trifolii.*

Composition of the leaves and stalks of barley at successive stages of growth, with special reference to the formation of lignin, M. PHILLIPS and M. J. GOSS (*Jour. Agr. Res.* [*U. S.*], *51 (1935), No. 4, pp. 301–319, figs. 6*).—An investigation carried out at the Bureau of Chemistry and Soils, U. S. D. A., yielded the following, among other, observations and conclusions:

After an initial increase, the percentages of ash and nitrogen declined steadily as the plant matured. The percentages of alcohol-benzene, cold water, and hot water extractives declined, though irregularly, as the plant grew. The 1 percent hydrochloric acid extractives showed no definite tendency.

The percentage of methoxyl in the original and in the extracted plant materials increased with the age of the plant.

The percentage of uronic acids increased somewhat during the early development of the plant and then declined as the plant matured. The percentage of the furfural-yielding components, as well as the percentage of pentoses calculated as pentosans, increased as the plant matured. After a slight initial increase, the percentage of furfural yielded by the uronic acids tended to decrease, and in no case did it amount to more than 18 percent of the total. The percentage of furfural yielded by the cellulose isolated according to the method of Cross and Bevan (E. S. R., 39, p. 614) showed an upward trend at first, but decreased somewhat as the plants matured. The furfural derived from the pentoses of the polyuronides showed a decrease in the first few weeks of the development of the plants, and then suddenly increased to such an extent that at maturity 56 percent of the total furfural was furnished by the pentoses of the polyuronides.

The percentages of Cross and Bevan cellulose, as well as the cellulose, increased rapidly as the plants grew older. As the plants matured there was a slight decrease in the percentage of these two components.

The percentage of lignin, as well as the methoxyl in the lignin, increased in a regular manner as the plants developed and matured. "The lignin from young plants differs from the lignin of mature plants in that the former contains a much smaller percentage of methoxyl. As the plants mature, not only does the percentage of lignin greatly increase, but there is also a rapid methylation of the hydroxyl groups of the lignin. In the mature plants, 75 to 80 percent of the firmly bound methoxyl groups are found in the lignin. No direct evidence was obtained that the barley plant synthesizes lignin from cellulose, pentoses, or pentosans. The results obtained are more in harmony with the hypothesis that the barley plant synthesizes lignin from soluble sugars other than pentoses."

Determination of the acids of plant tissue.—II, Total organic acids of tobacco leaf, G. W. Pucher, H. B. Vickery, and A. J. Wakeman (*Indus. and Engin. Chem., Analyt. Ed., 6 (1934), No. 2, pp. 140–143*).—In the second of this series of contributions from the Connecticut [New Haven] Experiment Station (E. S. R., 68, p. 438), it is shown that the organic acids of plant tissues can be quantitatively extracted by ether provided the material is acidified to approximately pH 1 with sulfuric acid.

"The extract so obtained contains no significant amounts of organic bases, or of mineral acids with the exception of nitric acid. The quantity of organic acids can be determined in the presence of the nitric acid by titration between the limits pH 7.8 and 2.6, according to the principle of the method of [D. D.] Van Slyke and [W. W.] Palmer,[1] by means of a quinhydrone electrode and potentiometer system." Under the conditions adopted oxalic acid behaved as a monobasic acid. "A method is therefore provided whereby the oxalic acid can be independently determined and the necessary correction calculated. The other acids usually encountered are titrated to the extent of approximately 90 percent." A correction factor applicable to the acids that occur in largest amount in tobacco leaf tissue is given. It is shown that only a minor modification of this factor would be required to permit the application of this method to other tissues.

The colloidal phosphate of milk, G. T. Pyne (*Biochem. Jour., 28 (1934), No. 3, pp. 940–948, figs. 2*).—Experiments on the effect of colloidal calcium phosphate (and carbonate) on the formaldehyde titration of calcium caseinogenate are interpreted as showing the existence of some type of chemical union between the calcium caseinogenate and the colloidal calcium phosphate of milk. The effect of oxalate on the titratable acidity of milk and caseinogen-calcium phosphate complexes appeared to indicate "that the inorganic colloid constituent is mainly, if not entirely, tertiary phosphate, a conclusion supported also by the results of experiments on the preparation and electrometric titration of the complexes. The results, taken together, suggest that the caseinogen-calcium phosphate of milk has the nature of a double salt of calcium caseinogenate and tricalcium phosphate."

The phosphatides of the wheat germ, H. J. Channon and C. A. M. Foster (*Biochem. Jour., 28 (1934), No. 3, pp. 853–864*).—Analyses of the oil prepared from seven samples of germ are recorded, together with a study of methods for extraction of the germ and of precipitation of the phosphatide from the extract. A method of working ethereal solutions of phosphatides with aqueous solutions which largely overcomes the persistent emulsions usually resulting is also described.

The phosphatide fractions from the extracts were analyzed for their contents of nitrogen, phosphorus, and ash, as well as for the yields of fatty acids obtained by hydrolysis. "The deductions made from these analyses were confirmed by a detailed investigation of the phosphatide fraction prepared from 9.5 kg of wheat germ. This fractionation showed the presence of phosphatidic acid (as calcium, magnesium, and potassium salts), lecithin, and cephalin. These substances occur in the approximate proportions of 4:4:1 when referred to the phosphorus content, at least 42 percent of the total phosphatide being present as phosphatidic acid."

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[1] Jour. Biol. Chem., 41 (1920), No. 4, pp. 567–585, fig. 1.

The application of absorption spectra to the study of vitamins and hormones, R. A. MORTON (*London: Adam Hilger, [1935], pp. 70, pls. 6, figs. 25*).—The author's preface notes that to obtain, by means of absorption spectrum measurements, such precise information as can be gained in this way in the cases of diatomic and the simpler polyatomic molecules is at present out of the question in the case of the large polyatomic molecules here dealt with. Of the value of absorption spectra in the type of work covered by this book, he states, in part, that "Vitamin research must always accept the animal test as the first and last court of appeal; the main service of absorption spectra lies in the possibility (which may not, of course, always eventuate) of supplementing the physiological description of an X substance by means of a physical criterion capable of aiding in identification and analysis."

The contents are: Vitamin D, vitamin A, vitamin B_1, vitamin B_2, vitamin C, vitamin E, and hormones.

Preparation of sintered Pyrex glass filters, P. L. KIRK, R. CRAIG, and R. S. ROSENFELS (*Indus. and Engin. Chem., Analyt. Ed., 6 (1934), No. 2, pp. 154, 155*).—The authors of this contribution from the University of California give in full working detail a simple procedure whereby they were enabled to prepare sintered glass filters of four grades of porosity, from one suitable for the rapid separation of coarse precipitates to a filter capable of retaining the finest analytical precipitates. Temperature was shown to be a factor much more critical in the production of a useful filter than the time during which the heating was continued.

A new distillation trap, O. S. RASK, E. KAPLAN, and H. C. WATERMAN (*Indus. and Engin. Chem., Analyt. Ed., 6 (1934), No. 4, pp. 299, figs. 2*).—The authors describe an apparatus, shown in a working drawing, which "is easily constructed and functions very satisfactorily even under a fluctuating house vacuum, in distillations of either foaming or bumping liquids filling the distilling flask into the neck."

Automatic vacuum regulator, G. F. LIEBIG, JR. (*Indus. and Engin. Chem., Analyt. Ed., 6 (1934), No. 2, p. 156, fig. 1*).—The construction and operation of a simple and inexpensive form of an automatically operating adjustable leakage valve are described in a contribution from the California Citrus Experiment Station.

"A regulator as described has been used very successfully in reducing a line vacuum of 26 in. (66 cm) of mercury to just a few inches for suction filtering."

Retention of dichromate by glassware, E. P. LAUG (*Indus. and Engin. Chem., Analyt. Ed., 6 (1934), No. 2, pp. 111, 112, fig. 1*).—Suggesting that "it has perhaps not been generally realized that the use of cleaning solution (sulfuric acid-potassium dichromate mixtures) may be a source of trouble in biology, chiefly through contamination of media kept in contact with glassware cleaned by this method", this note, contributed from the Woods Hole Marine Biological Laboratory, reports tests made by means of the a,δ-diphenylcarbohydrazide color reaction which indicated that "the safest and quickest method of disposing of the dichromate retained in the glass seems . . . [to be] to boil it out with several successive changes of boiling water, allowing at least 15 min.

for each treatment. Running cold water can also be used, but would probably require much longer."

Furoic acid as an acidimetric standard, H. B. and A. M. KELLOG (*Indus. and Engin. Chem., Analyt. Ed., 6 (1934), No. 4, pp. 251, 252*).—It was found that furoic acid can readily be purified, can be sharply titrated, and takes up but a few hundredths of 1 percent of moisture when kept under ordinary laboratory conditions for 3 mo. The 0.04 percent of moisture taken up in this time by the sample considered "was readily removed by careful fusion."

Note on the loss of nitrogen and sulphur on drying faeces, D. P. CUTHBERTSON and A. K. TURNBULL (*Biochem. Jour., 28 (1934), No. 3, pp. 837–839*).—The authors find that the process of drying feces on a water bath leads to a considerable loss of nitrogen (mainly as ammonia) and sulfur (mainly as sulfide). This loss can be prevented by adding an excess of a dilute solution of copper acetate to the feces before drying them in a closed vessel through which passes a current of dry, ammonia-free air, so that the ammonia liberated from the feces during drying can be trapped in acid.

An electric furnace for micro-Kjeldahl digestions and similar purposes, S. J. FOLLEY (*Biochem. Jour., 28 (1934), No. 3, pp. 890, 891, fig. 1*).—A row of eight flasks is heated by two separately connected 500-w heating coils. The coils are mounted on a shelf hinged at the back to permit adjusting the distance of the heating units from the flasks. Sheet copper reflectors are placed below the heating elements to lessen the heat loss caused by drafts and to increase the heating efficiency by reflection. The lead fume tube is connected to a water aspirator, and the unoccupied holes are to be closed. Running back of water distilling out during digestion, with danger of cracking the flasks, is prevented by placing rubber rings about the necks of the flasks at a height such that the water drops off into a metal trough placed below the fume tube and protected from corrosion by an acid-resistant paint.

Dilution method for micro-Kjeldahl determinations, O. HARTLEY (*Indus. and Engin. Chem., Analyt. Ed., 6 (1934), No. 4, p. 249*).—The author of this contribution from the U. S. D. A. Bureau of Home Economics finds that "the use of sulfuric acid as a dilution medium in micro-Kjeldahl determinations, where no microbalance is available, is convenient for materials insoluble in water, such as wool and silk, and reduces the time of digestion as compared with that required for water solutions. . . . Rapid solution occurs, without charring, when wool is heated with concentrated sulfuric acid in a thick-bottomed container, over a hot plate, with frequent shaking to avoid local overheating. A 0.2-g wool sample will dissolve in 10 cc of sulfuric acid in 3 to 5 min., giving a clear amber solution. Since special volumetric flasks with thick bottoms would be needed to apply a volumetric method, the solution was carried out in this laboratory in 30-cc dropping bottles. Portions containing 25 drops were then transferred to micro-Kjeldahl digestion flasks, the weights determined by difference, and the catalyst added."

Selenium, previously dissolved to a 1 percent solution in concentrated sulfuric acid by heating strongly, was found to be a better catalyst than a copper sulfate-potassium sulfate mixture. A digestion of from 25 to 30 min. proved sufficient for complete nitrogen recovery, hydrogen peroxide seldom being required. A volume of distillate rule was observed to have advantage over a time rule for the steam distillation.

Determination of potassium by sodium cobaltinitrite, J. E. SCHUELER and R. P. THOMAS (*Indus. and Engin. Chem., Analyt. Ed., 5 (1933), No. 3, pp. 163–165*).—"Place in a 250-ml beaker a 25-ml or less aliquot of the unknown potassium solution. Make just alkaline to phenolphthalein with sodium hydroxide and add 4 drops of acetic acid. After adding 10 ml of 95 percent ethyl alcohol, bring total volume of solution to 35 ml. Cool this solution to 5° to 6° C., and then add 5 ml of a similarly cooled sodium cobaltinitrite solution slowly down the sides of the beaker with shaking. After the precipitate and solution have stood overnight at 5° to 6°, filter on a freshly prepared asbestos pad and wash beaker and pad thoroughly with the cold wash solution. Usually 10 to 20 washings of 5 to 10 ml each will be sufficient. After completing the washing, transfer the pad and precipitate to the original beaker with a stream of hot water. If a Hirsch funnel, which is very convenient, is used to retain the asbestos, it is necessary to pour the water through it to rinse out the inside. Bring the content of the beaker to about 150 ml with the hot water and titrate immediately with standard potassium permanganate. Simultaneously with the starting of titration add from 5 to 10 ml of concentrated nitric acid with rapid stirring. Always keep an excess of permanganate present until nearing the end point. The pink color should remain for about 1 min. With this end point 1 ml of a 0.1 N potassium permanganate solution is equivalent to 0.0005672 g of potassium."

The above method, recommended in a contribution from the University of Maryland, is ascribed by the present authors to an unpublished communication from C. Peng. Various details, variations in which were found to have an important effect upon the accuracy of the results, are discussed.

Detection and estimation of small amounts of fluorine, I. M. Kolthoff and M. E. Stansby (*Indus. and Engin. Chem., Analyt. Ed., 6 (1934), No. 2, pp. 118–121, fig. 1*).—The qualitative test described in this contribution from the University of Minnesota requires a reagent of which 1 l is made from 0.16 g of zirconium oxychloride, 9 mg of purpurin (1,2,4-trihydroxyanthraquinone), 30 cc of ethanol, and 720 cc of concentrated hydrochloric acid. The zirconium salt is dissolved in 100 cc of concentrated hydrochloric acid, 100 cc of water being added to insure a clear solution. The purpurin is dissolved in the alcohol and the resulting solution added slowly with continuous shaking to the zirconium solution. The remainder of the hydrochloric acid is then added and the solution made up to 1 l with water.

"In the absence of interfering substances, the solid, or residue obtained after evaporating the solvent, is dissolved in 2 cc of 6 N hydrochloric acid, and 2 cc of the reagent are added. The pink color of the reagent will turn yellow immediately if 0.003 mg or more of fluoride is present. To confirm the presence of fluorine, solid zirconium oxychloride is added a little at a time with shaking. The color should turn pink again. If it does not, or if a cloudy or orange solution results after the addition of the purpurin-zirconium reagent, the presence of interfering elements which have destroyed the dye is indicated. The final acidity of the mixture should be between 7 N and 10 N with respect to hydrochloric acid. If the acidity is greater than 10 N, the color in the absence of fluorine is orange or yellow; if less than 6 N, a cloudy solution forms. The test becomes impossible at acidities of less than 4 N."

In the distillation method, used to separate the fluorine from interfering substances, the dry sample is distilled with about 1 g of silica powder and 25 cc of concentrated sulfuric acid from an absolutely dry apparatus, the distillate being collected in a test tube containing the test reagent. The direct test was found sensitive to 0.003 mg of fluorine, the distillation test to 0.005 mg. Interferences and their prevention are discussed.

A quantitative determination, accurate to about 2 percent, is based upon the same fading reaction of the purpurin-zirconium oxychloride compound.

Determination of fluorides in natural waters, J. M. Sanchis (*Indus. and Engin. Chem., Analyt. Ed., 6 (1934), No. 2, pp. 134, 135*).—The zirconium-alizarin method for the colorimetric determination of fluoride was modified for the quantitative estimation of the ion in potable waters. "The suggested procedure makes possible the use of distilled water in the preparation of the standards instead of synthetic water of similar mineral content as that of the water being analyzed", and so permits the use of one set of standards for the determination of fluorides in any number of fresh-water samples regardless of the composition of their mineral content.

The effect of varying quantities of sulfates in the water samples examined was completely masked by adding sulfuric acid in equal quantities to both standard and test solutions.

Determination of selenium and arsenic by distillation, W. O. ROBINSON, H. C. DUDLEY, K. T. WILLIAMS, and H. G. BYERS (*Indus. and Engin. Chem., Analyt. Ed., 6 (1934), No. 4, pp. 274–276, fig. 1*).—A rapid and accurate method, suitable for the examinations of soil and plant material required in an investigation of "alkali disease", has been developed at the U. S. D. A. Bureau of Chemistry and Soils.

"Selenium can be separated from all the other elements except arsenic and germanium by distillation with concentrated hydrobromic acid. The selenium must be in, or be converted into, the hexavalent condition before distillation in order to insure its distillation with the acid. In most cases, this conversion may be accomplished by the use of bromine. The excess of bromine distills at a low temperature, and the hydrobromic acid then reduces the selenium to the quadrivalent condition. In this form it readily distills along with hydrobromic acid. . . .

"Arsenic is quantitatively distilled along with the selenium and may be determined in the filtrate from the first selenium precipitation. If present in but small quantities, it is best determined by one of the modifications of the cerulean blue molybdate method of Denigès [E. S. R., 44, p. 611]."

Application of enclosed torch to estimation of arsenic in foods, R. E. REMINGTON, E. J. COULSON, and H. VON KOLNITZ (*Indus. and Engin. Chem., Analyt. Ed., 6 (1934), No. 4, pp. 280, 281*).—The method described "is applicable to products which contain sufficient combustible matter to burn freely in a current of oxygen. Consequently it can hardly have wide application in the estimation of spray residues on vegetables, which would have to be dried and ground before burning, except as a check on acid digestion. Its principal advantages, when applied to dried material or oils, are economy in time and reagents and the elimination of acid fumes from the air of the laboratory. Dry samples ranging in size from 5 to 100 g can be burned continuously in one operation, at a rate of 1 to 3 g per minute. The amount of oil that can be burned in one operation is limited to that which a cotton roll will absorb without leaking when subjected to the heat of the torch."

Determination of base exchange in soils with copper nitrate, E. A. FIEGER, J. GRAY, and J. F. REED (*Indus. and Engin. Chem., Analyt. Ed., 6 (1934), No. 4, pp. 281, 282*).—A rapid and accurate method for the determination of the base-exchange capacity of soils, which is said to result in "considerable saving in time when compared to the standard ammonium acetate method and eliminates some objections which have been raised to the older methods", is proposed.

Determination of total carbon in soils by the wet oxidation method, J. E. ADAMS (*Indus. and Engin. Chem., Analyt. Ed., 6 (1934), No. 4, pp. 277–279, figs. 2*).—It is claimed that "the apparatus presented obviates the necessity for glass seals to prevent contamination of the sample by the disintegration of rubber connections. A novel but efficient interception of the fumes from the oxidizing solution allows complete absorption of the carbon dioxide. The use of a measured quantity of absorbing solution permits a single titration with phenolphthalein as the indicator, with the elimination of the methyl orange titration except when desired as a check."

A comparison of some methods used in extracting soil phosphates, with a proposed new method, C. L. Wrenshall and R. R. McKibbin (*Jour. Amer. Soc. Agron., 27 (1935), No. 7, pp. 511–518, figs. 2*).—The authors report a comparison undertaken at Macdonald College of the soil-phosphate extracting power of the solutions of Truog and others with that of acid solutions containing the calcium and sulfate ions.

Differences in the extracting powers of comparable solutions of $KHSO_4$ and $Ca(HSO_4)_2$ and of comparable solutions containing $(NH_4)_2SO_4$ and $CaSO_4$ have been demonstrated, the cations present affecting the solubility of the soil phosphates. The action of solutions of pH 2.0 was shown to be drastic. A dependence of the difference in the extracting power of acid $(NH_4)_2SO_4$ and acid $CaSO_4$ solutions upon soil pH values or associated properties was indicated. The probable advantages of extracting with a solution containing the calcium and sulfate ions are pointed out.

A colorimetric method for the determination of n-acetylglucosamine and n-acetylchondrosamine, W. T. J. Morgan and L. A. Elson (*Biochem. Jour., 28 (1934), No. 3, pp. 988–995, figs. 2*).—A method satisfactory for the determination of from 0.1 to 1 mg of n-acetylglucosamine colorimetrically was obtained by eliminating sources of error found in several previous methods based upon heating a suitable alkaline solution and treating with *p*-dimethylaminobenzaldehyde in acid solution. n-acetylchondrosamine could be determined in a similar way.

Determination of small amounts of glucose, fructose, and invert sugar in absence and presence of sucrose, R. B. Whitmoyer (*Indus. and Engin. Chem., Analyt. Ed., 6 (1934), No. 4, pp. 268–271*).—The method depends upon the oxidation of potassium ferrocyanide to potassium ferricyanide by ceric sulfate after the ferricyanide has been reduced by the sugars in alkaline solution. The end point of the titration is to be obtained by using alphazurine G as the indicator. This dye proved very sensitive in acid solution to any excess of ceric sulfate but was not affected as long as any ferrocyanide remained in the solution.

The proposed method was developed with pure sugar solutions. Its accuracy when certain buffers and other impurities were present in the reduction mixture was also examined. Chlorides and tartrates had practically no effect on the reduction of the ferricyanide by invert sugar, while acetate and citrate buffers slightly affected the reduction. It is indicated that the influence of these buffers may be measured and proper correction made.

Determination of citrate, W. F. Bruce (*Indus. and Engin. Chem., Analyt. Ed., 6 (1934), No. 4, pp. 283–285, figs. 3*).—"The procedure consists principally in oxidizing citric acid by means of potassium permanganate in the presence of mercuric sulfate. The insoluble precipitate formed is determined gravimetrically. The analysis may be completed in 3 to 4 hr." A study of the conditions required in the determination and of some possible sources of interference was made.

Quantitative estimation of furfural at 0° C. with bromine, E. E. Hughes and S. F. Acree (*Indus. and Engin. Chem., Analyt. Ed., 6 (1934), No. 2, pp. 123, 124*).—A note contributed from the U. S. Bureau of Standards presents a method for the quantitative estimation of furfural by treating it 5 min. at 0° with an excess of 0.1 n potassium bromate plus potassium bromide in 3 percent hydrochloric acid and determining the unused bromine with potassium iodide and 0.1 n thiosulfate. The furfural combines with 1 mol of bromine.

A note on the general interpretation of fatty acid analyses by the ester fractionation method, T. P. HILDITCH (*Biochem. Jour., 28 (1934), No. 3, pp. 779–785*).—This is a critical summary of the possibilities and limitations of available methods. The author divides the component acids of natural fats into two groups of which the first, "the major component acid", consists of those occurring in proportions of from 5 or 10 percent of the mixed fatty acid upward, whereas the second group comprises those sometimes present in much smaller proportions. The treatment of these two groups presents "two essentially different general problems."

Estimation of aldehydes in rancid fats, C. H. LEA (*Indus. and Engin. Chem., Analyt. Ed., 6 (1934), No. 4, pp. 241–246, figs. 7*).—An investigation of the bisulfite method was carried out with a view to estimating small quantities of heptaldehyde and nonaldehyde in solution in an oil or fat. Purified heptaldehyde was determined with a sensitivity such that the aldehyde content of 1 g of cottonseed oil (containing approximately 0.1 percent of the aldehyde) could be determined with an accuracy of the order of 0.001 percent.

Data on the development of aldehydes in oxidizing fats are given.

A comparison of methods for the determination of uric acid in human, bovine, and avian bloods, G. H. PRITHAM and A. K. ANDERSON (*Jour. Lab. and Clin. Med., 19 (1934), No. 8, pp. 892–896*).—This contribution from the Pennsylvania Experiment Station reports upon a study undertaken with a view to ascertaining the most satisfactory method for the determination of uric acid, with particular attention to bovine and avian blood. The results of a comparison of the uric acid content of human, bovine, and avian bloods by the methods of O. Folin, Benedict (E. S. R., 47, p. 315), and H. Brown on laked and unlaked blood filtrates are given in detail in tabular form.

It is concluded "that for human and avian bloods it makes little difference which method is used, provided an isolation procedure is followed. Of the direct methods those of Benedict and of Folin, with Folin's unlaked filtrate, give results agreeing closely with the isolation procedures. For bovine blood Folin's direct method, applied to his unlaked filtrate, agrees most closely with the isolation procedure. The authors have found Folin's method more satisfactory than Benedict's, because the use of the urea-cyanide solution eliminates the formation of a troublesome precipitate which is always imminent when Benedict's method is used."

Comparative clarification of sugar solutions, L. G. SAYWELL and E. P. PHILLIPS (*Indus. and Engin. Chem., Analyt. Ed., 6 (1934), No. 2, pp. 116, 117*).—An investigation carried out at the University of California showed that solutions of invert sugar analyzed by the copper-reduction and iodine-oxidation methods are most satisfactorily clarified by neutral lead acetate and sodium oxalate, complete recovery of dextrose by the iodine method and 99.7 percent recovery by the copper method having been obtained. Other methods were less satisfactory, though when the iodine method was used with neutral lead acetate and potassium oxalate or basic lead acetate and sodium or potassium oxalate as clarifying reagents, recoveries of from 99.5 to 99.8 percent of dextrose were obtained. All methods except that using neutral lead acetate and sodium oxalate resulted in losses of from 0.8 to 7.8 percent of dextrose or reducing sugars as determined by the copper-reduction method.

Acidity titration of low-grade rosins, W. C. SMITH (*Indus. and Engin. Chem., Analyt. Ed., 6 (1934), No. 2, pp. 122, 123, fig. 1*).—An investigation reported from the Bureau of Chemistry and Soils, U. S. D. A., showed that, with the aid of a direct-vision hand spectroscope for observing the end point, the acid number of the lowest grade (reddest) rosin can be determined with a degree of accuracy equal to that ordinarily obtained with high-grade, or yellow, rosin. A photograph shows the nature of the absorption spectra obtained.

AGRICULTURAL METEOROLOGY

Monthly Weather Review, [July–August 1935] (*U. S. Mo. Weather Rev., 63 (1935), Nos. 7, pp. 213–243, pls. 10, figs. 8; 8, pp. 245–267, pls. 11, figs. 3*).—In addition to the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and bibliographical and other information, these numbers contain the following contributions:

No. 7.—Analysis of a Warm-Front-Type Occlusion, by H. Wexler (pp. 213–221); Preliminary Measurements of Ultra-Violet at Blue Hill Meteorological Observatory, by R. F. Baker (pp. 221, 222); Forecasting from Barometric Characteristics, by A. B. Serra (pp. 222, 223) (see below); and An Old Weather Diary in Northeastern Indiana, by B. B. Whittier (p. 224).

No. 8.—Correlation-Periodogram Investigation of Rainfall on the Western Coast of the United States, by E. J. Prouse (pp. 245–248); Relation of the Extremes of Normal Daily Temperature to the Solstices, by E. H. Bowie (pp. 248–250); and Tropical Disturbance of August 18–25, 1935, by W. F. McDonald (p. 250).

Forecasting from barometric characteristics, A. B. Serra (*U. S. Mo. Weather Rev., 63 (1935), No. 7, pp. 222, 223, fig. 1*).—Using the term "barometric characteristic" to mean the form of the barograph curve during the 3-hr. interval previous to observations, the author attempts to explain the connection between barometric characteristics and weather conditions. He states that "although we have not given a complete explanation of the connection between barometric characteristics and weather conditions, we regard the probabilities found to be helpful in short-period weather forecasting."

New data for the study of periodicity [trans. title], **J. Legrand** (*Compt. Rend. Acad. Sci. [Paris], 201 (1935), No. 12, pp. 509–511, fig. 1*).—What the author considers periodical oscillations in rainfall, water levels (Nile floods), and sun spots are presented graphically and briefly discussed. A dominating influence of sun spots is indicated.

Temperature, wind, humidity and evaporation in agricultural meteorology, J. W. Hopkins and M. F. James (*Canad. Jour. Res., 13 (1935), No. 4, Sect. C, pp. 191–201, figs. 6*).—In an abstract of this article the authors state that "a statistical study has been made of evaporation and allied meteorological observations for a period of approximately 20 yr. at each of two stations, situated in Montana and New Mexico, respectively. The average values, over this period, for May, June, July, and August of all four meteorological quantities showed a seasonal trend. At both stations July was the month of maximum average temperature, evaporation, and vapor pressure. Average wind velocity was greatest at both stations in May, decreasing progressively throughout the summer. In general, the extent of evaporation was markedly influenced by wind and vapor pressure as well as by temperature. Annual variations in evaporation during a specified calendar month were found to be correlated with temperature differences, but here also there was a significant additional effect of wind and vapor pressure. Evaporation measurements should therefore supplement temperature records in agricultural meteorological studies."

The data did not show any pronounced consistent effect of temperature in intensifying drought.

Soils of Italy from the climatic point of view [trans. title], P. Principi (*Italia Agr., 72 (1935), No. 9, pp. 721–731*).—This article explains briefly the relation of climatic influences to the origin, formation, and characteristics of different types of soils—podsol, chernozem, red, and peat soils.

The problem of drought and dry winds [trans. title], R. E. David (*Sotsialist. Zern. Khoz. (Grain Prod. Jour.), 4 (1934), No. 5, pp. 8–16; abs. in Deut. Landw. Rundschau, 12 (1935), No. 9, p. 569*).—Causes of conditions prevailing in the grain-growing region of south and southeast Russia (U. S. S. R.) are discussed. The chief of these are low winter rainfall and high evaporation. It is stated that the surest index of variations in yield in this region is the relation of precipitation to evaporation, the correlation coefficient of which is, on the whole, 0.9. Droughts which cause the greatest damage are those which occur during the most intensive period of growth up to the time of formation of grain. Winds play a less important part, although high winds accentuate the effects of drought.

[Influence of rainfall on the yield of cereals in relation to manurial treatment], W. G. Cochran (*Jour. Agr. Sci. [England], 25 (1935), No. 4, pp. 510–522, fig. 1*).—Basing his observations and conclusions on experiments on the continuous growth of wheat and barley under the same manurial conditions year after year at Rothamsted and at Woburn, the author considers that the evidence shows "a close relation between the response in yield to rainfall and the manurial treatment of the soil. In later investigations of a similar nature on barley at Rothamsted and on wheat and barley at Woburn, however, the evidence did not point to a significant effect of rainfall on yields, and on this account little can be said with confidence from these investigations. . . . The relation between seasonal variations in yield and manurial treatment is [however] just as clear at Woburn as on Broadbalk."

Influence of weather conditions on the nitrogen content of wheat, [I], II, J. W. Hopkins (*Canad. Jour. Res., 12 (1935), No. 2, pp. 228–237; 13 (1935), No. 3, Sect. C, pp. 127–133*).—As a result of investigations reported, it is stated that the nitrogen content of wheat is determined largely by rainfall effects and presumably by soil effects also. The results, however, did not confirm the theory that seasonal variation in moisture supply during the later weeks of development and ripening of the kernel are of prime importance in determining the composition of the grain.

"It is suggested that the preponderating effect of early rainfall may be due to the fact that it stimulates tillering and vegetative development generally. The available nitrogen must thus be distributed amongst an increased number of culms, whilst at the same time the total leaf area devoted to the production of carbohydrates is augmented."

"Coefficients designed to weight observed temperatures in proportion to their assumed effect on respiration were computed from the daily observations for three 3-week periods extending from July 1 to September 1. After allowing for the effect of May and June rainfall there was a moderate but significant partial correlation ($r=+0.33$) between nitrogen content and the sum of the temperature coefficients for the last two periods. There was a positive correlation ($r=+0.74$) between height of crop and yield of grain, and a negative correlation ($r=-0.50$) between height and nitrogen content. The partial correlation between nitrogen content and yield, after eliminating variations in both associated with height, was negligible ($r=-0.07$), suggesting that reductions in yield due to restriction of the later stages of translocation did not result in significant modification of the nitrogen content of the grain."

Agricultural meteorology in its relation to insect pests, T. V. Ramakrishna Ayyar and K. P. Anantanarayanan (*Madras Agr. Jour., 23 (1935), No.*

8, pp. 328–335, pl. 1).—This article discusses the importance of the relation between insects and climate; insects and weather conditions in South India; local studies of the influence of weather on insect life cycle and outbreaks, as illustrated especially in the case of certain insect pests of rice, namely, ***Spodoptera mauritia*, *Schoenobius incertellus*,** and ***Ripersia oryzae*;** and suggestions for future work.

It is suggested that collection of meteorological and microclimatic data in connection with insect studies may make it possible to predict pest outbreaks and help in their control. A plan of chronological sequence in such studies is outlined.

Combined sulfur carried down from the air to the soil [trans. title], G. Bertrand (*Ann. Agron. [Paris], n. ser., 5 (1935), No. 5, pp. 605–609*).—Analyses of rain falling at the Pasteur Institute in Paris showed combined sulfur varying annually from 1.751 to 2.8 g per square meter of soil. Similar observations at Grignon showed combined sulfur equivalent to about 2.5 mg of sulfur per liter, an amount considered negligible from an agricultural point of view. What is offered as a more accurate method of determining sulfur in rainfall is described.

SOILS—FERTILIZERS

Atlas of American agriculture.—III, Soils of the United States, C. F. Marbut (*U. S. Dept. Agr., Bur. Chem. and Soils, 1935, pt. 3, pp. 98, pls. 8, figs. 57*).—"The soil map in this publication, as well as the descriptions of soils in the accompanying text, are based almost exclusively on the accumulated results of the Soil Survey of the U. S. Department of Agriculture and on such general information regarding soil characteristics as has been obtained by traveling across the country in carrying on the work of the Soil Survey during the last 35 yr. In the mountainous parts of the country, in the deserts of the Great Basin region, and in the western part of the Great Plains, large areas have not yet been mapped. . . . In such areas the soil map is based on very general information." It is further noted, however, that "in all cases the map has been constructed on the basis of soil information only, and not on inferences derived from a consideration of climate, vegetation, or other feature of the natural environment." The work contains condensed discussions and interpretations of soils and parent material, soil classification, distribution of parent materials according to character and accumulation, distribution of soils without normal profiles, the color-profile chart, approximate chemical and mechanical composition charts, history of soil unit definition and soil classification in the United States, the combining of series groups into broader groups, and (by W. O. Robinson) the method of soil analysis used in the Bureau of Chemistry and Soils.

An extensive bibliography of pedological literature is included.

Graphic and quantitative comparisons of land types, J. O. Veatch (*Jour. Amer. Soc. Agron., 27 (1935), No. 7, pp. 505–510, figs. 4*).—The author of this contribution from the Michigan Experiment Station describes a more general application of a method of graphic representation of percentages of highland and lowland level areas and of the connecting slopes earlier devised and applied by him for the classification of certain of the Michigan orchard soils (E. S. R., 73, p. 445).

[Soil Survey Reports, 1930 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1930, Nos. 35, pp. 35, pls. 2, figs. 3, map 1; 36, pp. 37, figs. 2, map 1*).—The two surveys here noted were made with the respective cooperation of the Kansas and Texas Experiment Stations.

No. 35. *Soil survey of Marion County, Kansas*, E. W. Knobel and R. O. Lewis.—Marion County, east-central Kansas, has an area of 609,920 acres, for the most part gently undulating to slightly rolling lands, with some more nearly level areas. Cottonwood River and its many tributaries form the drainage system.

Idana silty clay, agriculturally the most important soil of the county, as well as the most extensive, covers 44 percent of the area surveyed, and Idana silty clay loam, of which about 90 percent is under cultivation, constitutes a further 12.7 percent of the county area. The soils found form 9 series of 22 types. It is estimated that about 12 percent of the land is nonarable.

No. 36. *Soil survey of Polk County, Texas*, H. M. Smith et al.—Polk County has an area of 643,840 acres of a rolling sandy section, of which the drainage conditions range from those of erosive rapidity on some of the sloping lands to those of "flat upland areas so slightly dissected that drainage is slow or practically lacking."

The survey lists 24 types in 14 series. Susquehanna fine sandy loam, 24.2 percent of the county and the most extensive type, is cultivated over only about 1 percent of its area, and "much soil is carried away, especially from land in cultivation." Segno fine sandy loam, 17.8 percent, and fine sand, 13.4 percent, together with Lufkin fine sandy loam, 15.3 percent, cover the remaining relatively large areas and are also developed to a very limited extent.

Local variability in the physical composition of Wisconsin drift, E. Winters and H. Wascher (*Jour. Amer. Soc. Agron., 27 (1935), No. 8, pp. 617–622, fig. 1*).—A contribution from the Illinois Experiment Station records the results and indications of mechanical analyses of 36 samples of glacial till. The data show the wide range in physical composition of Wisconsin drift within a small area. Using these analyses in conjunction with field observations, the authors define four till groups of which the properties differ enough to form the basis for soil series separation in the region.

The four till groups set up and defined are as follows: (1) Clarence, impermeable and plastic material containing from 60 to 65 percent or more of clay and colloid from 31 to 34 percent or more; (2) Plastic Elliott, slowly permeable, plastic material having a clay content of from 50 to 54 percent or more and a colloid content of from 26 to 28 percent or more; (3) Elliott, consisting of till material of slow to moderate permeability, a clay content of from 36 to 38 percent or more, and a colloid content of from 16 to 18 percent or more; and (4) Saybrook, a permeable till material showing a clay content of from 36 to 38 percent or less, colloid less than from 16 to 18 percent, and sand more than 15 percent.

The bases of the proposed classification are fully shown.

On the measurement of imbibitional water, E. W. Russell and R. S. Gupta (*Jour. Agr. Sci. [England], 24 (1934), No. 2, pp. 315–325*).—In a contribution from the Rothamsted Experimental Station, two related methods of determining the weight of water imbibed by a soil and one independent method of determining the volume of water imbibed are discussed. The three methods were shown to give concordant results. The first two methods are based on four assumptions: (1) That soils do not imbibe hydrocarbons, (2) that the density of the liquid in the fine soil pores is the same as the bulk density of the liquid, (3) that the volume of hydrocarbon held by a dry soil equals the volume of air held by the dry soil, and (4) that the volume of free water held by a wet soil equals the volume of air held by the dry soil.

"For the determination of the volume of the imbibed water it is only necessary to make the last assumption. The determinations on the weight, volume, and density of the imbibed water by these different methods are reasonably concordant for three of the soils." One of the methods did, however, give discrepant results for a soil which contains large quantities of readily decomposable organic matter. "It is, of course, not possible to argue that because the determinations of the weight and volume of the imbibed water are concordant therefore all the assumptions are valid, though the validity of the first three assumptions, which are only required for one of the determinations, is rendered more probable. The fourth assumption, however, is probably only partially true, for the amount of swelling of these soils in water appears to be sensitive to some uncontrolled factor, which is probably the closeness of packing. It is unlikely that any air can be entrapped during wetting causing these differences in swelling, since the wetting technic appears to allow the escape of all entrapped and adsorbed air.

"The tentative conclusion arrived at from these results is that the weight or volume of the water imbibed by a soil can be measured. The main limitation in this discussion has been, however, that the accuracy of the different methods is not sufficiently great to allow a consideration of the small differences usually found between one method and another."

The clay ratio as a criterion of susceptibility of soils to erosion, G. J. Bouyoucos (*Jour. Amer. Soc. Agron., 27 (1935), No. 9, pp. 738–741*).—From an analysis of existing data the author of this contribution from the Michigan Experiment Station reaches the conclusion that the (sand+silt)/clay ratio in soils may prove to be a criterion of value in judging the relative susceptibility of soils to erosion. This ratio is designated "the clay ratio." It was compared with the erosion ratio "by using the same soils and the same mechanical analyses of these soils as reported by the U. S. [D. A.] Bureau of Chemistry and Soils. The comparison shows that with few exceptions the two ratios agree fairly well in indicating the general susceptibility of soils to erosion."

The return of the desert, J. G. Hutton (*S. Dak. Acad. Sci. Proc., 14 (1928–29, 1931–34), pp. 29–34*).—In a contribution from the South Dakota State College, the author emphasizes the importance of soil organic matter in conferring cohesiveness and moisture-holding capacity upon the soil particles whereby the soil is enabled to resist wind erosion and to support plant growth. He attributes recent dust storms to exhaustive use of the soil and neglect of the maintenance of the organic matter content, and predicts the return of desert conditions if better methods are not substituted for those at present generally practiced.

Biochemistry of water-logged soils.—Part IV, Carbon and nitrogen transformations, A. Sreenivasan and V. Subrahmanyan (*Jour. Agr. Sci. [England], 25 (1935), No. 1, pp. 6–21, figs. 6*).—Extending their previous observations (E. S. R., 63, p. 511), the authors find that during the fermentation of water-logged soil containing added substances having various carbon: nitrogen ratios, the reaction first turns slightly acid but soon returns to the original H-ion concentration (pH 7.6); that the quantities of ammonia present in the medium increase up to a point, after which there is steady decrease; that there is nitrification only in the case of substances with narrow C:N ratios, the production of nitrate generally commencing only after about 1 mo., when the initial fermentation has subsided and fairly large quantities of ammonia have accumulated in the medium; that the extent of mineralization of nitrogen is determined chiefly by the C:N ratio (though in the cases of substances like mahua and lantana the presence of other constituents may also influence the processes), the quantities of mineralized nitrogen present in the soil system generally tending to decrease after about 2 mo.; that carbon is lost from all the added materials, especially those with wide C:N ratios (substances with narrow C:N ratios losing more nitrogen than the others); that there is practically no formation of complex nitrogenous bodies from substances with narrow C:N ratios, the major part of the added nitrogen being either mineralized or otherwise lost from the soil system; and that the loss of total nitrogen observed, especially in the case of urea and dried blood, is largely accounted for by volatilization as ammonia from the soil system.

"Under the swamp soil conditions, ammonification proceeds at a very much faster rate than nitrification so that there is accumulation of ammonia in the medium. The volatilization of ammonia is favored by the high temperature prevalent under tropical conditions. A similar, though less heavy, loss was also observed under dry soil conditions, accounting for over 60 percent of the total nitrogen lost from the soil system."

Investigation on the influence of ultra-violet rays on the physiological activities of Azotobacter.—II, On the stimulation of Azotobacter chroococcum by ultra-violet rays, A. Itano and A. Matsuura (*Ber. Ōhara Inst. Landw. Forsch., 6 (1935), No. 4, pp. 561-573, figs. 6*).—The preceding contribution of the series dealt (entirely in Japanese) primarily with the lethal action of ultraviolet rays on *A. chroococcum*, but it was found that a short exposure exerted a stimulatory effect. In this part studies of the latter phase are reported in which the Hanovia mercury lamp was used as the source of the rays. The results were as follows:

In hard-glass Erlenmeyer flasks the number of bacteria was greatest following 1 min. of exposure, and decrease in number followed longer exposures. The change in pH value was greatest following 1 min. of exposure, and it tended to become acidic. The stimulation was due solely to the action of the ultraviolet rays, the heat rays and the physicochemical changes in the media having but little influence. The electrical conductivity, pH value, and osmotic pressure were changed more than the viscosity and surface tension by exposing the medium to these rays, indicating that reduction occurred although the reaction could not be considered important in connection with the growth of the organism. Continuous exposure had a greater effect than intermittent exposure, although the time of effective exposure was shortened in the latter case.

A comparison of glass and quinhydrone electrodes for determining the pH of some Iowa soils, II, III, H. L. Dean and R. H. Walker (*Jour. Amer. Soc. Agron., 27 (1935), Nos. 7, pp. 519-525; 8, pp. 585-595*).—These papers continue an investigation earlier noted (E. S. R., 73, p. 447).

II. *The variability of results.*—The authors have studied the variability of the results obtained by the use of the glass and quinhydrone electrodes for determining the pH of some Iowa soils. The potentials of these electrodes were checked in a potassium acid phthalate buffer solution before and after the electrodes were suspended in a soil suspension for 20 min.

The variability in the pH of 25 samples of different soils when determined by either the glass or the quinhydrone electrode was apparently of little practical consequence. The addition of quinhydrone to the soil suspension increased the pH of each soil slightly when determined by either the glass or quinhydrone electrodes. This change in the pH, referred to as the QH error, was shown to be scarcely large enough to make the quinhydrone electrode method unreliable for determining the pH of the soils studied. The glass and quinhydrone electrodes gave similar results when employed to determine the pH of soil suspensions containing quinhydrone. "The QH electrode error, therefore, is of little or no consequence in the soils studied." The potentials of the glass and quinhydrone electrodes change somewhat during the process of pH determinations, making it desirable to check these electrodes against a known buffer solution at frequent intervals.

III. *The change in pH of the soil-water mixture with time.*—Report is made of experiments to determine the influence on the H-ion concentration of five Iowa soils of the length of time during which the soil was in contact with water in the form of a suspension. Seventy-five cc of distilled water was added to 35 g of soil and allowed to stand for 0-, 0.25-, 0.5-, 1-, 3-, 6-, 12-, and 24-hr. intervals, after which periods H-ion concentration was determined by the glass and quinhydrone electrodes on soil suspensions and on supernatant liquids. The data were analyzed statistically by the analysis of variance, and the following conclusions were drawn:

"The variability in the pH of quadruplicate samples of different soils at any time was comparatively small when determinations were made in either the supernatant liquid or the soil suspension. There was very little change in the pH of the supernatant liquids or the soil suspensions during the first 6 and 12 hr., respectively, after preparation. After that time, however, there was a significant increase in the pH of the acid soils and a decrease in the pH of the basic soil. This change in pH is presumably of no practical significance, as it does not occur until a rather long time after preparation of the samples for pH determination. The glass electrode method gave consistently lower results than the quinhydrone electrode method in all soils, except in the supernatant liquid of Marshall silt loam where it gave slightly higher results. The differences obtained by the two methods were so small that they are considered of little significance in actual practice. Repeated moving up and down of the glass electrode in the soil-water mixture resulted in lower pH values of the soils studied. It is recommended, therefore, that the electrode be moved up and down only two or three times in the soil-water mixture immediately after immersion, and that it then be left undisturbed until the pH determination is made."

Soil reaction and plant growth, J. Hendrick and W. Moore (*Highland and Agr. Soc. Scot. Trans., 5. ser., 47 (1935), pp. 34–49*).—"The evidence obtained, both in this country and elsewhere, indicates that the optimum growth of oats, potatoes, turnips, and swedes is obtained on a soil with an acid reaction. Generally speaking, the most favorable pH range for these crops seems to run between 5.5 and 6.5. Clovers and most grasses also can be grown favorably inside this range of reaction. Certain of the poor grasses grow best on more acid soils."

Most of the soils of the northeast of Scotland were found to have a range of reaction from about pH 5.5 to 7. "Such soils, therefore, have a favorable reaction for the principal crops grown in Scotland, but certain crops, such as sugar beet and barley, find many of our soils too acid for their most favorable growth."

A table indicates the preferential range for sugar beets and peas as that of from pH 6.0 to 7.5, barley about 5.7 to 7.5, red clover 5.5 to 7.5, wild white clover 5.5 to about 7.1, wheat 5.5 to 7.0, turnips about 5.1 to 6.5, oats 4.5 to about 6.2, potatoes 5.0 to about 6.2, and swedes about 4.7 to 6.0.

Soil acidity and methods of controlling it, R. W. Ruprecht (*Citrus Indus., 16 (1935), No. 7, pp. 16, 17*).—Although most Florida soils are acid, the author of this communication from the Florida Experiment Station warns against overliming which may produce a condition worse than the acidity. In one instance, "overliming caused a complete crop failure of both corn and peanuts. Likewise, overliming citrus groves will bring about an unhealthy condition of the trees which will take several years to correct." He recommends caution in the use of basic slag and of cyanamide on soils already neutral or nearly so.

[Soil and fertilizer investigations at the Pennsylvania Station] (*Pennsylvania Sta. Bul. 320 (1935), pp. 13, 14, 15, fig. 1*).—The agricultural value of blast furnace slag, mainly as a substitute for other liming materials, has been demonstrated by J. W. White, who reports also an experiment upon the relative values of limestone of various degrees of fineness; a study of the drainage of the Volusia soils; and field experiments on fertilizers for DeKalb soils. Results of a study by F. D. Gardner of the fertilizer requirements of Hagerstown soil are also noted.

Rates of solution and movement of different fertilizers in the soil and the effects of the fertilizers on the germination and root development of beans, C. B. Sayre and A. W. Clark (*New York State Sta. Tech. Bul. 231 (1935), pp. 67, figs. 8*).—Continuing earlier work (see p. 338), this is a detailed study of 13 nitrogen-, 4 phosphorus-, and 4 potassium-bearing fertilizers and of an acid and a neutral 4–16–4 fertilizer mixture in regard to fundamental factors which determine their relative effectiveness and disadvantages for row placement. Each fertilizer was applied in bands 1⅞ in. wide at the rate of 24 lb. of nitrogen, or 96 lb. of phosphoric anhydride, or 24 lb. of potassium oxide per acre in rows 28 in. apart. With each fertilizer, bean seeds were sown in contact with the fertilizer, ½ in. to the side of the band, and 2½ in. to the side of the fertilizer band. Seed was sown at the same time as the fertilizer was applied, and at intervals of 2, 4, 9, and 14 days after the fertilizer had been placed in the soil. Counts of the germination were made, together with detailed studies of the effect of the fertilizer on the root system. The reduction in germination, if any, and any injury to roots were determined for each fertilizer, as was also the time required for these injurious effects to disappear. The rate at which the nitrogen, phosphoric acid, and potash dissolved out of each band and the acid-base balance of each of the 23 fertilizers were determined by analyzing samples of each fertilizer before and after it had been in a band in the soil for 2, 4, 9, and 14 days. The movement in the soil of the nitrogen and phosphorus from 6 of these fertilizers was determined by analyzing narrow horizontal layers of soil at two levels above and three levels below the fertilizer bands.

There was considerable movement both upward and downward, but lateral movement of all of the fertilizers was very limited. The inorganic nitrogen and potash fertilizers dissolved at very rapid rates in the soil solution, reduced the germination of seeds planted in contact with the fertilizer band, and were toxic to roots for periods of from 9 to 14 days. Some of the organic nitrogenous fertilizers with much slower rates of solution were, nevertheless, exceedingly toxic to seeds and roots. "This was probably due to organic acids and soluble peptides in these organic fertilizers." None of the nitrogen or potash fertilizers stimulated root growth, but three of the phosphorus fertilizers greatly stimulated growth of roots directly in the fertilizer band.

A comparative test of different bedding materials and chemical supplements with cow manure applied in a three-year rotation, T. E. Odland and H. C. Knoblauch (*Rhode Island Sta. Bul. 251 (1935), pp. 10, fig. 1*).—Straw bedding manure has been compared with sawdust or shavings bedding manure over a period of 18 yr. in a 3-yr. crop rotation. The crops grown were oats and pea hay followed by rutabagas, silage corn, and timothy-clover hay. The two manures were applied on the basis of the same number of cow days per acre. Planer shavings were used for the first 9-yr. period and sawdust the second in comparison with straw. The average quantity of shavings used in the first period was 6 lb. per cow per day. For the same period 4.5 lb. of straw was used per cow day. For the second period the sawdust averaged approximately 20 lb. and straw 5 lb. per cow day. The manure was used at the rate of either 3 or 4 cords per acre annually. In both periods there was a small advantage in average yields for the straw manure over either the shavings or the sawdust manure. This difference in yield is considered best explained on the basis of the larger net amounts of excrement added where the straw manure bedding was used, due to the better absorptive qualities of the straw, rather than on that of any detrimental effect that might have resulted from the use of the sawdust or shavings.

The shavings and sawdust manure was supplemented with phosphorus, potash, or both, on some plats. All crops were increased in average yield by these additions but not to the same extent. The rutabagas responded especially to the addition of phosphorus, while the clover crop was increased most where potash was used as the supplement. The peas and oats under all treatments were benefited to approximately the same extent by all supplements used. With this large manure application and in a short rotation, the addition of these chemicals to the manure did not result in any significant increase in yields. Except in the case of rutabagas, the chemicals-only plat was not equal in yield to the manure-only plat when straw was used for bedding. The plat receiving chemicals had less total moisture, organic matter, and nitrogen than the manure plats at the conclusion of the experiment. There was no appreciable difference in soil acidity among the different plats.

"From this experiment it may be concluded that no detrimental effects to the land have resulted from the use of shavings or sawdust bedding as compared with straw."

Non-acid-forming mixed fertilizers.—I, Their effect on certain chemical and biological changes in the soil-fertilizer zone and on plant growth. II, The value of dolomitic limestone supplements of different degrees of fineness as measured by the increase in water-soluble magnesium in the soil, J. R. Taylor, Jr., and W. H. Pierre (*Jour. Amer. Soc. Agron.*, *27* (*1935*), *Nos. 8, pp. 623–641, figs. 10; 9, pp. 764–773, figs. 2*).—On the relatively acid soils studied at the West Virginia Experiment Station it is shown, in the first of the two papers here noted, that potentially neutral fertilizers containing dolomitic limestone supplement "promoted nitrification in the soil-fertilizer zone to a much greater extent than did acid-forming fertilizers. This was true especially on the more acid soils and where the rate of fertilization was high. Thus, in some cases, 4 to 15 times as high a percentage of the added ammonia was nitrified where the potentially neutral fertilizer was used."

The fertilizers containing dolomitic limestone gave a higher pH value in the soils used than did acid-forming fertilizers. Urea in a complete fertilizer gave a temporary increase in soil pH, an effect which persisted, to a slight degree, for some months in the case of heavy fertilizer applications on a very acid soil. Dolomitic limestone in the fertilizer markedly increased the water-soluble magnesium content of the soil fertilizer zone, and water-soluble phosphate was also increased. The "potentially neutral" fertilizers increased Sudan grass yields on four out of eight soils, the neutralizing component showing little effect on yields from the other four soils.

Paper 2 describes a greenhouse experiment on a Dekalb silt loam of pH 5.4, in which dolomitic limestone finer than 100 mesh liberated, when added in a mixed fertilizer, as much magnesium in the soil fertilizer zone as did magnesium sulfate of like magnesium content similarly used. From these and similar considerations the authors draw the conclusion that since many mixed fertilizers containing from 3 to 4 percent of nitrogen have an equivalent acidity of from 200 to 400 lb. of $CaCO_3$ per ton, "it seems probable that if such fertilizers are made nonacid-forming by the use of finely ground dolomitic limestone, they should supply a large part, if not all, of the magnesium needs of plants, even when grown on magnesium-deficient soils."

Experiments with nitrogenous fertilizers and limestone, J. W. Tidmore and J. T. Williamson (*Amer. Fert., 79 (1933), No. 11, pp. 6–8, 24, 26, 27*).—The continued use of acid-forming nitrogenous fertilizers on unlimed land caused reduced crop yields at the Alabama Experiment Station, and "the acidic nitrogenous fertilizers without limestone were less efficient for cotton on Norfolk sandy loam than sodium nitrate, whereas they were just as efficient when the land was limed." It is also stated, however, that "in 222 tests sodium nitrate increased cotton yields during a 5-yr. period more than any other nitrogenous fertilizer."

Nitrification of ammoniated peat and other nitrogen carriers, R. O. E. Davis, R. R. Miller, and W. Scholl (*Jour. Amer. Soc. Agron., 27 (1935), No. 9, pp. 729–737, figs. 7*).—In an investigation carried out at the Bureau of Chemistry and Soils, U. S. D. A., nitrification of ammoniated peat prepared at 180° and at 300° C. reached approximately the same maximum value in one series, about 24 percent conversion to nitrates. In another series of samples, the 180° sample showed 31 percent conversion and the 300° sample gave only 13.4 percent. In both cases the nitrification of the 300° material was slower in starting and the rate was less than in the case of the 180° material, indicating that the higher temperature had produced some effect that retarded the action of the bacteria.

Separation of the ammoniated peat into water-soluble and water-insoluble portions and subsequent nitrification tests showed that the water-soluble nitrogen compounds in both the 180° and 300° material were quite easily nitrified. "The nitrification curve for this portion follows very closely that for ammonium sulfate, and the limited number of experiments indicates that the extent of nitrification is about the same as with ammonium sulfate." The leached residues from ammoniated peat left after extracting the water-soluble portion gave somewhat varying results, from 6 to 17 percent conversion to nitrate. Ammoniated peat water-insoluble residue with sodium nitrate added gave a nitrification value of 13.4 percent after 6 weeks as contrasted with the 17 percent for a similar residue alone tested in the same series. Three ammoniated peat water-insoluble residues, with active nitrogen of 50, 80, and 87 percent according to the neutral permanganate method, all gave low conversion to nitrate of approximately the same values, 12, 10, and 11 percent, respectively.

The soluble portion from ammoniated dextrose gave a maximum conversion of 40 percent after 18 weeks. Ammoniated lignin and its leached residue gave nitrification values corresponding closely to those of ammoniated peat. The whole ammoniated starch gave about the same value as raw peat and somewhat less than the water-leached residues from ammoniated peat. The water-leached residue from ammoniated dextrose gave 8.2 percent of the total nitrogen as nitrate after 8 weeks. Ammoniated dextrose residue from exhaustive extractions with several solvents were nitrified somewhat more in each case than raw peat.

Magnesium ammonium phosphate nitrified at about the same rate as ammonium sulfate. Guanidine carbonate after 12 weeks had a conversion value of only 6 percent. Soil nitrogen alone, as shown by the check runs, attained average conversion to nitrate of 16.3 percent, which is about equal to that of the leached residues from ammoniated peat and somewhat greater than the raw peat. This would indicate that the insoluble nitrogen of ammoniated peat becomes available as nitrate at about the rate of the nitrogen in the naturally occurring soil organic matter.

Potash in Massachusetts soils: Its availability for crops, F. W. Morse (*Massachusetts Sta. Bul. 324* (*1935*), *pp. 16*).—The soils of Massachusetts are derived from glacial drift, which consists principally of material from potash-bearing rocks. Fertilizer experiments of long standing on soils of plain and terrace formation, more leached than upland soils or those of alluvial origin, indicated that the lighter soils required potash. Heavy clay soils did not require the addition of this element.

"Potash has been determined in an acid solution. So far as can be ascertained, the percentages of potash have been influenced principally by the texture of the soil. The finer the soil, the more potash has been dissolved by the acid. The soils of two fields used for fertilizer experiments have been sampled plat by plat where no potash fertilizer had been used. The samples were separated into sands and silt clay. The sands contained a lower percentage of total potash by fusion than the silt clay but held the major portion of the soil potash. One soil contained twice as much silt clay as the other, which indicated a larger amount of available potash. Characteristic samples of important soil series were separated into sands and silt clay. Total potash by fusion was determined in them. The average percentage of potash in sands was 2.07 and in silt clay 2.13. The lowest percentage of potash was 1.27 in the sands overlying a diorite ledge. A review of investigations of the water-soluble potash in soils showed that the soil particles yield an important part of the potash required by crops. Efficient use of potash fertilizer should include the available soil potash as part of the supply for the crop. Clay presents more surface to the soil solution than sand and also holds more water. Therefore, clay soils supply more available potash than sandy soils of similar origin."

The distribution and condition of phosphorus in three horizons of a differentially fertilized Hagerstown clay loam soil planted to apple trees in metal cylinders, W. Thomas (*Jour. Agr. Res.* [*U. S.*], *51* (*1935*), *No. 4*, *pp. 321–339*, *fig. 1*).—In an investigation carried on for 6½ yr. at the Pennsylvania Experiment Station the distribution of phosphoric acid (P_2O_5) in three horizons of a Hagerstown clay loam soil, contained in cylinders planted to apple trees, and treated with different combinations of sodium nitrate, monocalcium phosphate, and potassium sulfate, was found to be as follows:

In all the phosphate-treated cylinders the total quantities of phosphoric acid in the surface soil were greater in the cylinders under sod than in those under cultivation, but in the subsurface layer (from 7 to 21 in.) the absolute quantities of phosphoric acid present were considerably smaller in the cylinders under sod than in those under cultivation. The downward movement of phosphoric acid into the subsurface layer in the cylinders under cultivation was equivalent approximately to 10 percent of the phosphoric acid added. There was no evidence of movement of phosphoric acid into the subsurface layer in the cylinder under sod nor into the subsoil (from 21 to 53 in.) of the cylinders either under cultivation or under sod. "An explanation advanced is that the differences in the movement phosphorus in the two culture systems is for the most part the result of the mobilizing effect of humic acids."

A simple and compact percolation apparatus is described. By its use the quantities of phosphoric acid removed in successive leachates from the original soil before the trees were planted and in the soils from untreated and phosphate-treated cylinders by various weak acid solvents were obtained. The results of these extractions are recorded as follows:

"In the phosphate-treated cylinders at least one moderately soluble phosphate was present which dissolves in proposition to the mass of it in the soil. Not a trace of phosphoric acid was found in the leachates from any horizon of the original soil (soil before trees were planted) either by distilled water (pH 5.5) or by 0.002 N sulfuric acid (pH 3.0). Thirty-three percent of the phosphoric acid applied to the phosphate-treated cylinders was still soluble in distilled water at the end of the 7-yr. experiment. One-third remained in a condition of moderate solubility, and one-third was converted into basic iron and aluminum compounds more difficultly soluble than ferric phosphate. There was a conversion into difficultly soluble phosphates of that portion of the applied phosphoric acid that had moved into the subsurface layer in the cylinder under cultivation." A marked increase was observed in the availability of the phosphoric acid of the soil in the check cylinders over that of the original soil.

Phosphorus content and buffer capacity of plant sap as related to the physiological effect of phosphorus fertilizers in fibrous low-moor peat, J. R. Neller (*Jour. Agr. Res.* [*U. S.*], *51* (*1935*), *No. 4*, *pp. 287–300*, *figs. 6*).—It is reported from the Florida Experiment Station that the total soluble phosphorus of the saps of five plants—shallu, buckwheat, sugarcane, rape, and corn—growing under field conditions on the characteristic brown fibrous peat of the Everglades was much increased by soil dressings with soluble phosphates. Lime acted to reduce and sulfur to increase the assimilation of phosphorus in all these plants. Total acidity and the total amount of inorganic phosphorus tended to vary directly with the concentration of soluble phosphorus in the sap. Active acidity of the plant sap, expressed as pH values, changed inappreciably as a result of different phosphatic treatments, whereas the buffer capacities were much greater in the saps of high phosphorus content. Neither the specific conductivities nor the total soluble solids of the saps appeared to have any definite relation either to phosphorus concentration or to physiological injury. The crops that responded unfavorably, if at all, to phosphorus were those of which the saps were relatively high in phosphorus in the absence of soil treatment with a phosphate carrier. Those that responded favorably, on the other hand, contained sap relatively low in phosphorus.

The mechanism of phosphate retention by natural alumino-silicate colloids, G. D. Scarseth (*Jour. Amer. Soc. Agron.*, *27* (*1935*), *No. 8*, *pp. 596–616*, *figs. 9*).—According to this communication from the Alabama Experiment Station, a natural aluminosilicate (bentonite) freed from mobile ions by electrodialysis and made up into 16 series of 0.8 percent suspensions was found to sorb phosphate ions. Maximum retention occurred between pH 5.2 and 6.1 when calcium ions were the exchangeable cations present and at about pH 6.1 when sodium ions were present. The anion sorption capacity in the presence of sodium ions was found to be approximately one-third of the cation sorption capacity. The calcium ions greatly increased the phosphate sorption capacity of the colloidal complex in the acid range. At the point where the cation valences were saturated with calcium ions (pH 8.2), the concentration of phosphate ions in solution decreased as the concentration of the unsorbed calcium ions increased, because of the formation of insoluble calcium phosphates. All the phosphate was found to be insoluble when the system contained free calcium carbonate. No insoluble phosphates were formed at the high pH values occurring when sodium ions were the cations used.

The phosphate retained at the pH values of from 5.5 to 6.1 is believed to be sorbed on the colloidal surfaces of the aluminosilicate by the aluminum valence. The phosphate ion was found to be exchangeable and was replaced by hydroxyl and orthosilicate anions. The retention of the phosphate ion by the colloid was greatly increased when iron was introduced into the aluminosilicate. With calcium on the clay complex and after the systems that received 25.8 millimols of phosphoric acid per 100 g of colloid had been carbonated, the minimum retention occurred between pH 4.0 and 5.5. "The formation of iron carbonate from the carbonation treatment lowered the concentration of iron ions, thus permitting a greater amount of phosphate ions to remain in solution. The maximum retention occurred at pH 3.0 where insoluble iron phosphates were formed, and at pH values above 8.0 where insoluble calcium phosphates were formed in the presence of calcium carbonate. . . . The data show that plant injury from light applications of lime is caused by a decrease in the availability of the phosphate and is likely to occur only in soils relatively low in sesquioxides. Changing the pH from 4.0 to between 5.5 and 6.2 caused all the phosphate to be retained by the low-iron colloid when the amount of phosphate added to the system was relatively small, but when the amount of phosphate added was large the retention was not nearly complete.

"The phenomenon of the replacement of the phosphate anion from the aluminosilicate colloidal systems by the silicate anion as found in the laboratory studies was verified with four soils in greenhouse pot tests with sorghum plants. The most outstanding phosphate replacement resulted on a very acid, heavy clay soil with a silica-sesquioxide ratio of 2.3, where sodium silicate produced a growth without a phosphatic fertilizer almost equal to that on the phosphate-fertilized soil."

The effect of dilution on the solubility of soil phosphorus, H. DUKES (*Jour. Amer. Soc. Agron., 27 (1935), No. 9, pp. 760–763, fig. 1*).—Water extracts of a number of soil types were made at the Florida Experiment Station, 1 part of soil being added to quantities of water varying from 0.5 to 15 parts. "The results show that the concentration of phosphorus in the extracts increased with dilution up to a certain point for each soil, and upon further dilution decreased. Samples of soil were also leached with distilled water and the successive leachates analyzed for calcium and phosphorus. The results show that the phosphorus reached its maximum concentration at the point where the calcium first disappears from the leachates."

The direct use of superphosphate, R. M. SALTER (*Amer. Fert., 83 (1935), No. 3, pp. 7–10, 22, 24, 26, figs. 2*).—In an address by the chief agronomist of the Ohio Experiment Station, the shift of opinion during some 20 to 25 yr. from a soil-improvement system based upon the use of legumes, manures, and phosphates to a system making a much larger use of complete fertilizers is traced in a brief outline. The possibilities of direct phosphate application and the conditions under which such a practice is to be recommended are then taken up, and the paper is supplemented by opinions obtained from the Connecticut, Wisconsin, Iowa, Missouri, Texas, North Carolina, and Alabama Experiment Stations.

The efficiency of soil and fertilizer phosphorus as affected by soil reaction, R. M. SALTER and E. E. BARNES (*Ohio Sta. Bul. 553 (1935), pp. 49, figs. 13*).—This bulletin deals with the effects of liming the naturally acid Wooster and Canfield silt loams upon the availability of soil phosphorus and upon the comparative efficiency of different phosphate fertilizers.

A notable tendency for phosphate response to decline as the soil reaction was changed from about pH 5 to about pH 7.5 by repeated lime applications occurred in the older experiments. In these experiments "the yields of plats receiving either nitrogen and potash or manure but no phosphorus remained about constant or increased on limed land but decreased markedly on unlimed land." These facts are interpreted as indicating an increase in the availability of native soil phosphorus as the reaction is made more alkaline up to about pH 7.5, a view supported by data from a short-time legume-reaction experiment in which the response of a number of crops to superphosphate at five pH levels, approximately 4.5, 5.0, 6.0, 7.0, and 7.5, decreased in both directions from about pH 5 or 6. With most crops very nearly maximum yields were produced at the most alkaline reaction without phosphate. Soil phosphorus soluble in dilute organic acids at constant pH also was lowest at pH 5, increased markedly up to pH 7.5, and was higher at pH 4.5 than at pH 5. With a result agreeing with these observations, Sudan grass in a greenhouse pot experiment removed considerably more phosphorus from unphosphated soil at pH 7 than at pH 6.

Steamed bone meal showed an efficiency, as compared with superphosphate, of about 80 percent for the cereals and timothy, and was about equal to superphosphate for clover on unlimed land of approximately pH 5. As the soil reaction was increased to about pH 7.5 by repeated liming, the efficiency of the bone decreased to zero for corn, to about 20 percent for oats and wheat, and to 30 percent for clover. It is concluded that bone meal is an unsatisfactory source of phosphoric acid on limed Wooster and Canfield soils.

Basic slag phosphate showed an efficiency, as compared with superphosphate, of about 85 percent for the cereals on unlimed land. It was superior to superphosphate by about 40 percent for clover under the same conditions. With repeated liming to about pH 7.5, the efficiency of basic slag dropped to zero for corn but only to about 70 percent for wheat and oats and to 85 percent for clover. The phosphorus of rock phosphate had an efficiency of about 40 percent for both grain crops and clover on unlimed land. With repeated liming to about pH 7.5 its efficiency dropped to 10 percent or less for the same crops. Its efficiency for sweetclover at about pH 7 was a little above 50 percent.

Monoammonium phosphate, in a 1-yr. field experiment with wheat, showed an efficiency as compared with superphosphate of 69 percent at pH 5.5. This increased to 73 percent at pH 6 and to 112 percent at pH 7. The efficiency of the ammoniated superphosphate, measured in a 1-yr. field experiment with wheat and in the greenhouse experiment with Sudan grass, varied both with the degree of ammoniation (nitrogen content) and with the soil reaction. The materials containing less than 3 percent nitrogen showed efficiencies ranging from 72 to 100 percent with no consistent variations in efficiency between soil reactions of pH 5.5 to 7. The material containing about 5 percent nitrogen showed lower availability than the less highly ammoniated product at all reactions. The material containing about 7 percent nitrogen was still less efficient. Both the 5 and 7 percent materials decreased in efficiency with increasing pH, the latter more markedly, its average efficiency in the greenhouse experiment being only 23 percent at pH 7.

"In general, it appears that the efficiency of all phosphate fertilizers on these soils decreases as the soil reaction approaches alkalinity. Compared to superphosphate, the efficiency of the more acid phosphates, monoammonium and manocalcium phosphates, tends to increase with increasing pH, that of low-ammoniated superphosphate changes very little, whereas materials containing phosphorus in the form of tricalcium phosphate, either as such (highly ammoniated superphosphates) or in carbonate or fluoride combinations (bone meal and rock phosphate, respectively), show decreasing efficiency with increasing pH and are not well adapted for use on neutral or alkaline soils. Basic slag appears to occupy an intermediate position between these two groups of phosphates."

The temporary injurious effect of excessive liming of acid soils and its relation to the phosphate nutrition of plants, W. H. PIERRE and G. M. BROWNING (*Jour. Amer. Soc. Agron., 27 (1935), No. 9, pp. 742–759, figs. 5*).—In a report from the West Virginia Experiment Station on 10 acid soils ranging in pH value from 4.4 to 5.6, 9 gave poorer growth of alfalfa when brought to pH values near neutrality than when lower amounts of calcium carbonate were used, the average decreased yields when the pH values were slightly above

7.0 being 46 percent. With 5 of the 9 soils the overliming injury to alfalfa disappeared after the first year, however.

Corn grown on an acid Dekalb loam which had been limed to pH values of approximately 6.5 and 7.5 showed marked injury and developed a light green to purplish color characteristic of phosphorus starvation. Additions of manganese sulfate, magnesium sulfate, ferrous sulfate, iron humate, or large amounts of muriate of potash did not correct this condition. The additions of large amounts of monocalcium phosphate, monopotassium phosphate, or silica gel overcame the injury, however. The substitution of increasing amounts of magnesium carbonate for calcium carbonate, up to 75 percent, also markedly improved growth and produced normal leaf color where the largest amount was added, and the materials that overcame liming injury materially increased the water-soluble phosphate in the soil solution and soil extract.

Other observations are recorded, and it is concluded "that the temporary overliming injury obtained in these experiments is due to a disturbed phosphate nutrition."

The effect of certain fertilizer materials on the iodine content of important foods, J. S. McHargue, D. W. Young, and R. K. Calfee (*Jour. Amer. Soc. Agron., 27 (1935), No. 7, pp. 559–565*).—"Crude Chile nitrate, raw rock phosphate, and limestone rocks may contain enough iodine to influence the iodine content of forage crops and vegetables when applied in adequate amounts to soils deficient in iodine", according to this communication from the Kentucky Experiment Station, and "plants may absorb relatively large amounts of iodine without producing any signs of toxicity. It is a simple matter to increase the iodine content of forage crops and vegetables by adding appropriate amounts of potassium iodide to the soil in which they are grown. Tests by dialyses and the separation of various protein fractions of a sample of corn that contained a relatively large amount of iodine showed that this element was present in organic combinations and therefore in suitable form for assimilation by livestock and man."

The new fertilizer plan, R. W. Ruprecht (*Citrus Indus., 16 (1935), No. 8, pp. 8, 9*).—The author discusses in detail certain changes in the Florida fertilizer law and also calls attention to the danger of inducing a toxic condition by using excessive quantities of the supplementary elements utilized by plants only in minute quantities.

A survey of fertilizer and plant-food consumption in the United States for the year ended June 30, 1934, C. J. Brand, A. L. Mehring, and H. R. Smalley (*Natl. Fert. Assoc. Proc., 11 (1935), pp. 138–203, fig. 1*).—This report, prepared by the Bureau of Chemistry and Soils, U. S. D. A., and The National Fertilizer Association, is made up largely of tabulated data covering, in some cases, 50 or more years. A map indicating average grade in percentage of total plant food by States shows that fertilizers of the highest plant-food content (25 percent or more) were used in Maine, Wisconsin, Minnesota, Iowa, Idaho, California, and Arizona, whereas fertilizers of the lowest grade in plant-food content (less than 16 percent) were confined to North Carolina, South Carolina, and Georgia.

AGRICULTURAL BOTANY

Temperature as a predetermining factor in the development of Avena sativa, T. M. Plitt (*Plant Physiol., 10 (1935), No. 2, pp. 269–289, figs. 3*).—The purpose of this study was to obtain indications as to what differences, if any, are produced in germinating seeds and in seedlings of *A. sativa* by different temperature conditions during germination.

Oat seeds germinated at 25° C. for 5 days had a markedly lower percentage of dry weight than those germinated at 5°. These differences were directly related to the growth rates of the seedlings at the two temperatures and to the amount of carbon and hydrogen consumed in respiration. A somewhat lower percentage of starch remained in the seeds germinated at 25°, more water was imbibed, and the proportion of soluble to insoluble nitrogen was slightly higher than at 5°.

Microscopical and microchemical findings are reported in detail, including carbohydrate and protein relations and the histological differences observed. Silica is apparently shown to be a negligible factor in the supporting mechanism.

High temperatures during the very early phases of germination had much less effect on the lodging of oats than was indicated by the work of G. Gassner (1910). No temperature treatment used during early germination consistently induced lodging, either immediately or at later stages of growth.

Development of the chlorophyll and carotenoid pigments in barley seedlings, G. MACKINNEY (*Plant Physiol., 10 (1935), No. 2, pp. 365–373*).—The author found fluctuations in the chlorophyll and carotenoid contents of barley seedlings grown for short periods in culture solutions modified in their supplies of iron and potassium. The constancy of the chlorophyll: carotene ratio, as noted by H. von Euler and H. Hellström (1929) for etiolated seedlings, is now extended to include chlorotic seedlings and also those recovering from the chlorosis induced by lack of iron. In general, chlorophyll and the carotenoids fluctuated together, although the cartone: xanthophyll ratio was markedly lower in the chlorotic leaves. Under certain conditions, the effect of potassium, whether a specific or a general nutrition effect, was to increase the pigment content.

The divergent results reported in the literature emphasize the importance of critical examination of the methods to be used for studies of the development and functions of these pigments, and various methods are here discussed.

Effect of solar radiation on transpiration of Helianthus annuus, E. V. MARTIN (*Plant Physiol., 10 (1935), No. 2, pp. 341–354, figs. 5*).—The author attempted to separate the effect of radiation from that of other environmental factors under natural conditions. To fulfill these conditions, the influence of radiation on the transpiration rate of *H. annuus* was measured under shade tents so constructed as to transmit different amounts of radiation but to permit freedom of air circulation.

Though the 10 series of tests included a rather wide range of conditions, the relation between radiation intensity and transpiration rate in all cases proved to be a linear one within the limits of experimental error. The results of all the tests were satisfactorily represented by equations of the type $T=b+mR$, in which T is the transpiration rate, R the radiation intensity, b the intercept on the T axis, and m the slope of the straight line. It was found that b varied directly with the evaporating power of the air and m inversely with the age of the plant.

The fraction of the transpiration rate due directly to radiation is represented by the ratio $mR/(mR+b)$, and for plants in full sunlight it varied from 38 to 81 percent, depending largely on the evaporating power of the air.

Calculations of probable errors indicated an average accuracy within 5 percent.

Carbon dioxide balance at high light intensities, E. S. MILLER and G. O. BURR (*Plant Physiol., 10 (1935), No. 1, pp. 93–114, figs. 12*).—The important feature of the apparatus used in this study was the closed system which permitted a continuous and vigorous circulation of air about the plant, thus making possible an easy control of humidity, temperature, and evaporating power of the air. This system kept the roots cool, yet the temperature of the air surrounding the leaves could be varied between 4° and 37° C. A Haldane-Carpenter apparatus was employed for the CO_2 and O_2 analyses. One hydrophyte, 7 mesophytes, and 2 xerophytes were used, and the land plants were potted.

All the plants at some temperature quickly reduced the CO_2 in the chamber to 0.01 volume percent (over 24 hr. for some plants). As the 0.01 percent concentration was approached, the curves broke fairly sharply—a close approximation to Blackman's ideal graph for limiting factors. The limiting percentage of CO_2 was independent of leaf properties and temperature, providing the high temperatures introduced no abnormal metabolism. This independence of CO_2 balance from temperature suggests that a dark reaction of photosynthesis has a temperature coefficient equal to the temperature coefficient of respiration. Plants segregate themselves into definite groups according to their behavior at high temperatures. This CO_2 balance depends on the concentration of dissolved CO_2 and not on the total CO_2 (carbonic acid plus bicarbonates).—(*Courtesy Biol. Abs.*)

Effects of exfloration on plant metabolism, S. Austin (*Plant Physiol., 10 (1935), No. 2, pp. 225–243, figs. 10*).—The data here presented are for two crops of Ito San soybean plants grown out of doors (1931–32) in well-inoculated soil, all flowers being removed from one series but left to develop on the controls.

In normal plants, growth stopped at about the time of fruit development, suggesting that the latter might be responsible. On the other hand, exfloration failed to increase vegetative development.

Soybeans are photoperiodic, and apparently the shortening of the day length not only initiates the reproductive phase but also curtails the vegetative processes. A shorter day is required to inhibit growth than to initiate flowering.

An abnormal accumulation of carbohydrates occurred in exflorated plants, but nitrogen did not accumulate in such plants, nor was it depleted in control plants by fruit development. Calcium, magnesium, phosphorus, and potassium also were not depleted by fruit development.

As the plants ceased to grow, there was an increase in the percentage of dry weight (a decrease in water content) in both exflorated and control plants, and these conditions were associated with a marked decrease in the percentages of potassium in all parts of the stems and leaves. Phosphorus also decreased in the stem tips when the stems ceased to elongate.

The behavior of exflorated soybean plants resembled the responses of some other plants to potassium starvation. It is therefore suggested that the length of day may affect vegetative growth through its influence on the concentration of potassium in the plant tissues.

Growth, organic nitrogen fractions, and buffer capacity in relation to hardiness of plants, S. T. Dexter (*Plant Physiol., 10 (1935), No. 1, pp. 149–158*).—In this study conducted at the University of Minnesota, winter wheat, cabbage, etc., were grown in the greenhouse in sand culture under various conditions of mineral nutrition. When transferred to a room at 2° C., with continuous illumination, winter wheat increased greatly in dry weight, sugar, and nitrogen per plant. Plants free from mineral nitrogen hardened at 2°, but those low in carbohydrates did not harden at 2° in the dark. Whether hardening occurred or not, and regardless of the presence or absence of mineral nitrogen, all plants increased in soluble organic nitrogen when placed at 2° for a few days. Plants high in carbohydrates were acid and poorer buffers than those of the same age but low in carbohydrates. Those high in carbohydrates hardened at 2°, while the others did not. No change in buffer capacity was evident on exposure to low temperatures, and the acidity became slightly less whether or not hardening occurred. Continuous low temperature (2°) was more effective than were alternating temperatures (2° and 20°) in producing hardening in high carbohydrate plants stored in complete darkness.—(*Courtesy Biol. Abs.*)

A review of researches concerning floral morphology, H. BANCROFT (*Bot. Rev., 1 (1935), No. 3, pp. 77–99*).—This is a general, critical review indicating the chief lines along which attempts have been made to solve the problems relating to the organization of angiospermic structures. The discussion follows the three main headings of the "old" morphology, the "new" morphology, and "developmental" morphology.

The author concludes that not only must considerations of angiospermic flower form and structure, both normal and teratological, be combined with developmental studies and checked by reference to palaeontological facts and to the reproductive structures of other living groups, but they must also be approached in relation to the problems of organic form and function as a whole. No line of investigation must be overlooked. The problems of organic form and function await not only solution but even their full formulation.

A literature list of 102 titles is given.

The presence of abnormal rice kernels which are either germless or which possess two embryos [trans. title], M. KONDŌ and S. ISSHIKI (*Ber. Ōhara Inst. Landw. Forsch., 6 (1935), No. 4, pp. 515–524, figs. 3*).—The authors studied the characteristics and the inheritability of these two abnormal forms. Seeds without embryos differed in appearance from the normal only in being somewhat smaller, and the space ordinarily occupied by the embryo was filled by the endosperm.

These germless kernels occurred in normally fertilized rice plants, and their frequency was very low (from 0.01 to 0.02 percent). In general, this condition was not inheritable, but was a type of malformation induced at fertilization or at the beginning of embryo development.

The double embryo seeds were somewhat larger than normal, and they were of two types. In the one the two embryos lay at either side, and in the other in the middle of the seed. Two plumules and two rootlets developed from the double embryo seeds, but the seedlings were so weak that both embryos could scarcely develop, one or both of them often dying. There were also among them seeds which failed to germinate. The time of the emergence of the panicles and that of full maturity, as also the seed yield, was the same in plants from the two-germed as from the normal seeds. The double embryony of rice was not inherited, but was due to the fact that two ovaries in the same flower sometimes united, now at the dorsal, now at the ventral side. The frequency of this condition was very low (about 0.003 percent).

Dehydration and infiltration, D. A. JOHANSEN (*Science, 82 (1935), No. 2124, pp. 253, 254*).—On the assumption that successful dehydration and infiltration do not necessarily depend on successful fixation and that good infiltration occurs when water is replaced but the water-absorbing capacity of the tissue is not destroyed, the author sought a fluid miscible in all proportions with water, ethyl alcohol, paraffin, and balsam, which would replace the water without alteration in the water-absorbing capacity. Working with plant tissues he found both dioxane and tertiary butyl alcohol to fulfill these conditions, and he enumerates the advantages obtained by their use.

A mechanism for controlled continuous flow of nutrient solutions, F. P. MEHRLICH (*Plant Physiol., 10 (1935), No. 1, pp. 169–177, figs. 5*).—This apparatus, developed at the Hawaiian Pineapple Producers' Experiment Station, is a mechanization of Shive's device (E. S. R., 52, p. 125) for constantly renewing nutrient solutions to plant cultures, incorporating the advantages while eliminating certain unsatisfactory features of his method. It is an essentially self-starting, closed system difficult for dirt to enter, it has a capacity of 38 l or more, and the reserve nutrient may be constantly renewed without upsetting the rate of delivery.

A unit is composed of one or more 5-gal. glass carboys as inverted reservoirs connected by tubulatures to a covered, constant-level reservoir. Fitting into the cover through rubber stoppers are a number of heavy-walled, capillary, glass siphons leading to the separate plant containers. Several cultures are served from a single unit. The flow to each is set at any prescribed rate by precisely adjusted inclination of the individual siphon leading to it. More than one rate of drip may be served simultaneously from a single unit, and the rate of solution delivery may be altered according to the requirements. A screw adjustment brings any number of units to an equal rate of flow.

By covering the surface of sand cultures with white quartzite pebbles and leading the nutrient solution below these, algae are controlled and evaporation is limited.—(*Courtesy Biol. Abs.*)

A modified culture jar, R. P. Marsh (*Science, 82 (1935), No. 2124, p. 256, fig. 1*).—Using the Black Wilson variety of soybean grown in Shive's 3-salt R2S1 solution (E. S. R., 36, p. 328), the author found that more uniform conditions are maintained in culture solutions and that better plant growth occurs when the excess solution is drained from the bottom of the culture jar rather than siphoned from near the top.

Osmotic quantities of plant cells in given phases, A. Ursprung (*Plant Physiol., 10 (1935), No. 1, pp. 115–133, figs. 2*).—The author discusses the osmotic quantities to be determined and the methods of measuring them, and presents a critical review of the various terminological proposals, with the following conclusions:

The earlier studies of osmosis led to confusion because a common name was applied to different quantities. The creation of methods which permit the determination of the different quantities numerically, as well as in concept, constitutes the essential difference between the more recent studies and the older ones. To avoid misunderstandings, a new terminology became necessary. It embraces the following expressions: Suction force of the cell (S_{z_n}), suction force gradient, suction force of the contents of the cell (S_{in}), suction force at incipient plasmolysis (S_{z_g})=(S_{i_g}), osmotic value (O_n), osmotic value at incipient plasmolysis (O_g), wall pressure (W_n), turgor pressure (T_n), and the turgor distention produced by the turgor pressure. The terms are unequivocal, simple, and easy to understand.—(*Courtesy Biol. Abs.*)

Linkage between output of electric energy by polar tissues and cell oxidation, H. F. Rosene and E. J. Lund (*Plant Physiol., 10 (1935), No. 1, pp. 27–47, figs. 6*).—A new apparatus and technic, described in the text, made it possible to measure the effect on the electromotive force of the uninjured intact root when oxygen or other gases were applied to a root region 1 mm or more in length without mechanical stimulation or change in humidity or temperature. The conclusions were as follows:

The magnitude, orientation, and distribution of electromotive forces per unit length of root in *Allium cepa* are quantitatively linked with oxidative metabolism. Equal change in oxygen concentration around different regions of the root tip affects the regional polarity potentials in an unequal manner and concomitantly alters the electric polarity of the whole root tip. There is a correspondence between the gradation of effects on regional polarity potentials produced by equal change in oxygen concentration and the regional distribution of progressively greater tissue differentiation. The gradient of distribution of the electromotive force (per unit length of the root tip), which is an expression of gradation in rate of output of electric energy quantitatively associated with corresponding differences in velocity of oxidation and structural differences, is changed by changes in oxygen tension around the root tip. It is different in (1) moist air, (2) hydrogen, and (3) oxygen. In hydrogen the observed electric energy output by the cells is diminished, and in oxygen it is increased.

The results furnish additional evidence for the validity of the theory that continuously maintained electromotive forces are generated by the redox system of the cell. The magnitude of the electromotive force at any instant depends on the condition of a flux equilibrium in the process of cell oxidation. The facts constitute real evidence that the velocity of oxidation in the young, relatively undifferentiated tissue of the apical end of the root apex is greater than that in the older, permanently differentiated tissue of the base, and that the active mass of oxidizable substance is greater in young tissue.—(*Courtesy Biol. Abs.*)

Proof of the principle of summation of cell E. M. F.'s, H. F. Rosene (*Plant Physiol., 10 (1935), No. 2, pp. 209–224, figs. 5*).—This study was undertaken to determine the magnitude and direction of the change in electric polarity induced by "liquid shunts" around the roots of onion (*Allium cepa*), using an apparatus previously described. The roots were grown in tap water, and those selected for study were from 50 to 80 mm long. The results were as follows:

The electric polarity of a given region of the root tip was decreased or increased when an electrolytic solution such as tap water (liquid shunt) surrounded a segment of that region. The extent of the change was directly related to the length of this shunt, and the direction was determined by the orientation of the polarity potential in the segment concerned. The electromotive force level before the liquid shunt was applied was reestablished when it was removed. The observed changes in electromotive force induced by the addition of a liquid shunt were distinguished from the rhythmic fluctuations induced by causes of internal origin by the abruptness of the change on addition of the shunt. The changes observed are determined by ions in the solution applied. The results indicated that the system of continuously maintained electromotive forces in the root involves cells arranged in series so that their polar axes coincide. Liquid shunts applied to a region outside of the electrode circuit induced no change. There was no effect on the injury electromotive force of frog sciatic nerve following the procedure used with onion roots. Thus, the observed change in the electromotive force of the root induced by a liquid shunt is uniquely characteristic of the system of maintained cellular electromotive forces in the root.

The observations furnish direct evidence that the principle of algebraic summation of electromotive forces in polar cell systems applies to the electric polarity of onion roots.

The effects of zinc salts on the oxidation process in plant cells, H. S. Reed and J. Dufrenoy (*Science, 82 (1935), No. 2124, pp. 249, 250*).—The authors present a brief review of published work on the role of zinc in plant metabolism in general, and of their own work at the Citrus Experiment Station, Riverside, Calif., on mottle leaf of oranges, in which they showed an accumulation of zinc in the meristematic cells of the buds and in the palisade cells of the leaves, renewed activity in the leaf cells after spraying with very dilute solutions of zinc sulfate, and accelerated growth of new shoots on trees after application of zinc salts.

Toxicity of aluminum on seedlings and action of certain ions in the elimination of the toxic effects, W. S. EISENMENGER (*Plant Physiol.*, *10* (*1935*), *No. 1*, *pp. 1–25*, *figs. 4*).—In studies at the Massachusetts Experiment Station, using the seedlings of corn, soybeans, and buckwheat, the toxicity of aluminum citrate and tartrate was determined over ranges of from 0 to 100 percent of 0.006 M concentrations. These salts yield no precipitates of aluminum hydroxide over rather wide ranges of pH. To determine the effects of OH^- and Ca^{++} and K^+, plants were grown in solutions containing percentage proportions of 0.006 M $Ca(OH)_2$, KOH, and $Ca(NO_3)_2$ singly and with aluminum citrate or tartrate in pairs. Solutions of citric acid as acidic as the corresponding aluminum citrate were not so toxic as the aluminum salt. Both the Ca^{++} and the OH^- ions decreased the relative toxic effect of the aluminum salts, and $Ca(OH)_2$ was the most effective for the three plants used.—(*Courtesy Biol. Abs.*)

Investigations on agar.—II, Physico-chemical properties of agar and their influence on the growth of microorganisms, A. ITANO and Y. TSUJI (*Ber. Ōhara Inst. Landw. Forsch.*, *6* (*1935*), *No. 4*, *pp. 575–586*, *pls. 3*).—The results of this study indicated that agars differ widely in their properties within the different grades, and their use influences the physiological activities of the micro-organisms grown on them. It is therefore necessary to purify commercial agars before their use in delicate microbiological studies.

The influence of Phytomonas tumefaciens and Phytomonas rhizogenes on the actual acidity of certain liquid and agar substrata, A. R. WILSON (*Phytopathology*, *25* (*1935*), *No. 9*, *pp. 854–863*, *figs. 2*).—In this study at the Wisconsin Experiment Station, *P. tumefaciens* (pathogenic and nonpathogenic strains) and *P. rhizogenes* (pathogenic strain) were grown on carrot-infusion and yeast-infusion glucose mineral-salts agar, and in liquid media.

For the determination of the pH value of the bacterial masses and of the agar media, the quinhydrone electrode proved as accurate as the glass electrode. Changes in the pH value were more rapid on agar than in corresponding liquid media. On the yeast agar but little change was induced by *P. tumefaciens*, whereas *P. rhizogenes* produced a rapid fall in the pH value followed by an equally rapid rise. In the corresponding liquid medium, *P. rhizogenes* produced a gradual fall in pH value during the 32 days of the experiment. In carrot-infusion liquid and agar media, a rise in pH value occurred with all three organisms. No appreciable differences in pH value were noted between cultures of the pathogenic and nonpathogenic strains of *P. tumefaciens* when grown above and below the critical maximum temperature for gall formation. Free ammonia was formed in all cultures by *P. rhizogenes*, but in carrot-infusion liquid medium alone by *P. tumefaciens*, indicating considerable differences in nitrogen metabolism.—(*Courtesy Biol. Abs.*)

Plant material introduced by the Division of Plant Exploration and Introduction, Bureau of Plant Industry, July 1 to September 30, 1933 (*U. S. Dept. Agr.*, *Inventory 116* (*1935*), *pp. 19*).—This number lists 870 lots of plant material introduced for testing in the United States, and in many cases notes are included.

GENETICS

Studies in Indian barleys.—III, Branched ears in barley and their mode of inheritance, R. D. BOSE (*Indian Jour. Agr. Sci.*, *5* (*1935*), *No. 2*, *pp. 155–164*, *pl. 1*).—This is the third of the series (E. S. R., 66, p. 326). The inheritance of branched spikes in barley was observed to depend on duplicate factors in a cross between the 2-rowed Chevalier and the 6-rowed Pusa Type 21 barleys. Neither parent nor the F_1 showed this characteristic, which appeared only in F_2 and subsequent generations. Factors for branched spikes segregated independently of factors responsible for the inheritance of fertility of the spike.

Chromosome numbers in relatives of Zea mays L., R. G. REEVES and P. C. MANGELSDORF (*Amer. Nat., 69 (1935), No. 725, pp. 633–635*).—The gametic and somatic chromosome numbers, respectively, found in cytological studies at the Texas Experiment Station were for *Euchlaena mexicana* 10, 20; *E. perennis* 20, 40; *Tripsacum dactyloides* 18, 36 and 36, 72; *T. laxum*, *T. latifolium*, and *T. pilosum* 36, 72; *Coix lachryma stenocarpa*, *C. lachryma-jobi*, *Scleracbne punctata*, and *Polytoca barbata* —, 20; and *Manisuris cylindrica* 9, 18. A fuller account is to be published later.

A summary of linkage studies in maize, R. A. EMERSON, G. W. BEADLE, and A. C. FRASER (*[New York] Cornell Sta. Mem. 180 (1935), pp. 83, fig. 1*).—The major features of this compilation of data from many sources on chromosomal relationships in corn comprise an alphabetical list of genes with brief descriptions of the characters affected and authorities therefor; descriptions of each of the 10 linkage groups with tables of available linkage data involving the genes and translocations in each group; a linkage map (prepared by M. M. Rhoades) of the 10 chromosomes of *Zea mays* showing loci of genes whose position can be determined with reasonable certainty; and a list of references, including 218 titles. The manner of interaction of certain genes concerned with pigment formation; morphology of reproduction; chromosome number, behavior, and rearrangement; and genetic nomenclature are discussed briefly.

Inheritance of characters in Setaria italica (Beauv.), the Italian millet.—VII, Plant purple pigmentation, G. N. RANGASWAMI AYYANGAR, T. R. NARAYANAN, T. NARAYANA RAO, and P. SESHADRI SARMA (*Indian Jour. Agr. Sci., 5 (1935), No. 2, pp. 176–194, pls. 3*).—According to the results of the studies reported in the seventh number of this series (E. S. R., 70, p. 317), plants of Italian millet are either pigmented (anthocyanic) or without purple pigment (nonpigmented). The pigmented condition is dominant, arises by the basic presence of a factor *P*, and has various manifestations and intensities. A factor *I* determines a manifestation in intensity, which is dominant to a manifestation in a weaker depth. The degree to which *P* is operative, in addition to being influenced greatly by the presence of *I*, is conditioned by the factors *V* and *H*, which determine the readiness with which *P* manifests in the vegetative or earhead parts. The interactions of *P*, *I*, *V*, and *H* factors produce the diversity of forms characterizing varieties of this millet.

Inheritance of earliness and length of kernel in rice, J. W. JONES, C. R. ADAIR, H. M. BEACHELL, and L. L. DAVIS (*Jour. Amer. Soc. Agron., 27 (1935), No. 11, pp. 910–921*).—A study of the possibility of isolating from crosses selections earlier and later than either parent and also lines having kernel lengths different from those of the parents was made at Biggs, Calif., Stuttgart, Ark., and Beaumont, Tex., by the U. S. D. A. Bureau of Plant Industry, working in cooperation with the experiment stations in those States.

Segregation in F_2 for first heading in Bozu X Edith and Bozu X Blue Rose appeared to be controlled by nutritional genetic factors; in Colusa X Edith mainly by complementary genetic factors indicating a ratio of 9 to 7; in Colusa X Blue Rose, largely by one main genetic factor giving about 3 late to 1 early plant. In F_2 populations of Butte (short grain) X Edith (long), Caloro (short) X Honduras (long), Lady Wright (long) X Calora, Colusa (short) X Blue Rose (medium), and Edith X Blue Rose the length and breadth of kernel in 2 crosses appeared to be controlled by multiple genetic factors.

The F_2 segregation at the 3 stations for date of first heading and kernel length was essentially the same regardless of differences in climatic conditions.

The inheritance of a substance in the roots of seedling hybrid derivatives of Lolium perenne L. × Lolium multiflorum Lam. causing a fluorescence reaction visible in filter-paper by screened ultra-violet light, A. H. Woodforde (*Jour. Linn. Soc. London, Bot., 50 (1935), No. 333, pp. 141–150*).—Behavior of crosses between *L. perenne* and *L. multiflorum* indicated fluorescence as a simple Mendelian dominant. Italianate characters were dominant in the hybrid generation, but so far there has been no evidence of complete dominance of the annual or biennial habit associated with *L. multiflorum*. No genetic linkage was observed between fluorescence and awned flowering glumes.

The unreliability of selection in the F_2 for breeding wheat resistant to flag smut, J. R. A. McMillan (*Jour. Council Sci. and Indus. Res.* [*Aust.*], *8 (1935), No. 3, pp. 214–222*).—A study of 16 crosses between varieties of wheat with different degrees of resistance or susceptibility to flag smut (*Urocystis tritici*) carried through the F_4, indicated that for practical purposes diseased F_2 plants produced as resistant F_3 lines as did the healthy ones. However, there was a high degree of correlation between the amount of disease in an F_3 family and that in the corresponding F_4 progenies.

For breeding flag smut resistant varieties, an individual plant test (e. g., in the F_2) for reaction to the disease is useless, and selection should be based on progeny tests beginning with the F_3. If the F_2 population is small a flag smut test may be definitely harmful, since it reduces the amount of material from which to select for other characters.

The inheritance of resistance to common bean mosaic in field and garden beans, W. H. Pierce (*Phytopathology, 25 (1935), No. 9, pp. 875–883, figs. 2*).—This study from the Idaho Experiment Station dealt with crosses involving three resistant varieties (Corbett Refugee, Robust, and Great Northern UI No. 1) and the susceptible Refugee Green variety. All the hybrids involving Corbett Refugee proved resistant in the F_1 generation, but crosses of Great Northern UI No. 1 and Robust with Refugee Green were susceptible in F_1.

In F_2 the Corbett Refugee-Refugee Green hybrids segregated 89 percent resistant plants when Corbett Refugee was used as the pollen parent, and 82 percent with the reciprocal cross. The F_2 progenies of Great Northern UI No. 1×Refugee Green segregated from 15 to 18 percent resistant plants and Robust×Refugee Green 12 percent.

Crosses between certain resistant varieties segregated susceptible plants in F_2. Corbett Refugee×Great Northern UI No. 1 segregated 11 percent susceptible plants and Corbett Refugee×Robust 20.8 percent. Great Northern UI No. 1×Robust did not segregate in F_2, indicating the resistance of these two varieties to be similar. Idaho Refugee and Wisconsin Refugee, two homozygous resistant varieties selected from the Refugee Green (♀)×Corbett Refugee(♂) cross, were backcrossed to Refugee Green. Analysis of the F_2 indicated that these two resistant varieties possessed the same degree of resistance as the original resistant parent variety, Corbett Refugee.

The data from these various crosses are concluded to be sufficiently consistent to allow accurate predictions of what might be expected of the resistant varieties studied when crossed with other varieties.

Notes on the inheritance of quantitative characters in a cross between two varieties of garden pea (Pisum sativum L.), S. Clay (*Jour. Pomol. and Hort. Sci., 13 (1935), No. 3, pp. 149–189, figs. 9*).—Studies of the F_2 and later generations of a cross between the Little Marvel pea and a variety known as FB showed that narrow pod, small seed, Little Marvel shaped seed, abundant two-flowered racemes, early flowering, rapid pod development, and short stem to the first fertile node are associated to a varying degree in the hybrids. From the results it is evident that resistance to disease and insects, capacity for withstanding adverse conditions, and an ability to develop full-seeded pods might also be included in the foregoing group. The author believes that seed size and seed shape are each dependent on a single pair of allelomorphs. A generally simple relationship was found to hold for pod breadth, perhaps modified by minor genes or possibly by factorial interrelationships in some instances.

An analysis of the breeding value of certain plum varieties, W. H. Alderman and E. Angelo (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 351–356*).—Observations at the Minnesota Experiment Station on a total of 2,980 plum seedlings representing 85 parental combinations and consisting in part of second generation seedlings obtained by means of sib matings and crosses of first-generation plants showed only 31 worthy of a superior rating. These 31 seedlings were derived from 14 parental combinations, and 23 had Burbank as one parent. It was apparent that hybrids originating from crosses of *Prunus salicina* with various American species are far more productive of good seedlings than those from crosses between American species. In the case of reciprocal crosses between *P. salicina* and *P. americana* a much larger proportion of promising seedlings were secured when *P. salicina* was the ovule parent. The chances of securing valuable seedlings from open pollination appeared very slight unless very large populations were grown. The data on the various crosses are presented in tabular form.

Inheritance of gooseberry leaf infection, A. S. Colby (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 397–399, fig. 1*).—Observations at the Illinois Experiment Station on 1,301 gooseberry seedlings of known parentage showed considerable differences in the progenies with respect to resistance to anthracnose and leaf spot. Transparent × Rideau and Como self pollinated were particularly promising progenies. Carrie appeared to have value as a source of resistance, and Poorman, Glenndale, Oregon Champion, Downing, and Minnesota No. 96 whether crossed or selfed seemed to impart resistance. Reciprocal crosses yielded practically the same results.

The best parents in red raspberry breeding, G. L. Slate (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 407–410, fig. 1*).—An analysis of records taken by the New York State Experiment Station on 7,684 raspberry seedlings produced during the period 1903–31 indicated that crossing is much superior to selfing as a means of creating strong, vigorous seedlings. On a basis of promising seedlings, Lloyd George proved to be one of the most outstanding parents. The most effective combinations were Lloyd George × Newman and Lloyd George × Newburgh. Newman is said to be the best source of firm-fruited seedlings. Of a total of 334 seedlings derived by selfing, only four were worthy of a second trial and only one was named (Ontario). Cuthbert in general did not yield many good seedlings, although it transmitted its high dessert and canning qualities.

A study of mutations in evolution, I, II, R. C. Robb (*Jour. Genet., 31 (1935), No. 1, pp. 39–52, figs. 5*).—Two papers on this study are reported.

I. *Evolution in the equine skull.*—Through study of the specimens of fossil Equidae of the American Museum of Natural History, it is shown that as the total body size of the prehistoric horse increased from the cat-size *Hyracotherium* to the large modern horse, the ratio of the face length to cranial length was doubled. No evidence was found to indicate that genes for specific differences in form operated during the evolutionary process.

II. *Ontogeny in the equine skull.*—Skull measurements of fetal young and mature horses, including the ratio of face length to cranial length, are tabulated and show that the changes in the skull shape agree with those occurring during the evolution of the horse of different sizes.

Foundations and inferences of line breeding [trans. title], A. Sciuchetti (*Züchtungskunde, 10 (1935), No. 9, pp. 334–341, figs. 2*).—This is a discussion of the theoretical expectation from line breeding toward the concentration of the qualities of superior individuals.

The production of melanin by cold in black-eyed complete albinos and in the exhibition of permanently hidden genes without crossing [trans. title], W. Schultz (*Nova Acta Leopoldina, n. ser., 2 (1935), No. 3–4, pp. 258–291, pls. 2*).—A white Vienna-Russian rabbit, due to the genes $a_n^x\ a_n x$, has been produced which is free of pigment when raised under normal conditions but in which the iris may be darkened by exposure to lower temperatures. Differences in the temperatures necessary for causing the production of pigmentation in Russian rabbits of different genotypes (E. S. R., 72, p. 756) are pointed out.

Genetic factors in the response of feather follicles to thyroxin and theelin, C. H. Danforth (*Jour. Expt. Zool., 65 (1933), No. 2, pp. 183–197, pl. 1*).—Theelin and thyroxin were administered to birds of six different genotypes and the response noted. Both hormones tended to produce feminization of the male plumage in the different genotypes.

The follicular apparatus of the ovary of the immature rat and some of the factors which influence it, C. E. Lane (*Anat. Rec., 61 (1935), No. 2, pp. 141–153, fig. 1*).—Determinations were made of the number of follicles, differentiating between those with and those without loosening of the granulosa (vesicular) in normal female rats from 15 to 66 days of age. Injections of doses equivalent to 0.1, 0.05, and 0.025 g of acetone-dried sheep pituitary in 22-day-old female mice increased the percentage of follicles with antra from 29.2 percent in the controls to 63.7, 82.8, and 47.6 percent, respectively, for the 3 doses, although the doses were so small that they did not cause gross ovarian changes or establishment of the vaginal orifice.

The effect of resection on different parts of the oviduct on the formation of the hen's egg, V. S. Asmundson and J. G. Jervis (*Jour. Expt. Zool., 65 (1933), No. 3, pp. 395–420, figs. 5*).—In investigations at the California Experiment Station and the University of British Columbia studies were made of the influence on the eggs of resectioning and removal of various portions of the oviduct of hens. After resectioning a portion from the wall of the uterus the shell and shell membrane were modified, whereas the shape of the egg was not changed except after resectioning a part of the isthmus. The amount of thick albumen was much reduced by removal of a part of the albumen tube of the oviduct.

Colorimetric estimation of oestrin in the urine of non-pregnant women, G. F. Marrian and S. L. Cohen (*Nature [London], 135 (1935), No. 3426, p. 1072*).—A study of the colorimetric method in the determination of estrin in the urine of nonpregnant women (E. S. R., 74, p. 25) did not prove satisfactory.

The influence of sex hormones on the brood of the hen [trans. title], W. Koch (*Züchtungskunde, 10 (1935), No. 9, pp. 331–333*).—Daily feeding of 50 mouse units of an oil solution of a follicular hormone not only stimulated egg production but the percentage of fertile eggs, and egg hatching was increased from 43.8 and 39.5 percent to 64.1 and 62.1 percent, respectively.

A prepubertal reversal of the sex difference in the gonadotropic hormone content of the pituitary gland of the rat, H. M. Clark (*Anat. Rec., 61 (1935), No. 2, pp. 175–192, figs. 3*).—Studies of the influence on ovarian weights of immature mice of the implants of the pituitary of male and female rats ranging in age from 1 day to 285 days showed that the glands from female donors from 13 to 18 days of age were more potent, whereas the glands of the male donors from 7.5 to 10 mo. of age were more potent than the glands of females of the same age.

A sex difference in the change in potency of the anterior hypophysis following the bilateral castration in newborn rats, H. M. Clark (*Anat. Rec., 61 (1935), No. 2, pp. 193–202*).—Continuing the above studies, only negligible differences were found in the gonad-stimulating potency of the hypophysis of males and females gonadectomized at one day of age. Castrated males showed an increase averaging 102 percent in pituitary potency, compared with normal males, but no particular differences were noted in normal and gonadectomized females.

Modification of mammalian sexual cycles.—II, Effects upon young male ferrets (Putorius vulgaris) of constant eight and one-half hour days and of six hours of illumination after dark, between November and June, T. H. Bissonnette (*Biol. Bul., 68 (1935), No. 2, pp. 300–313, pl. 1*).—Continuing this series (E. S. R., 69, p. 34), study was made of the mating reaction and sperm-ejaculating power of ferrets kept on short days from November 10 until killed on February 24, March 15, and April 8, and comparable animals kept on long days during this period. The onset of sexual activity was hastened in two of the long-day animals, but not in the third; whereas the onset of sexual activity in animals exposed to short days was delayed. In the ferrets exposed to the longer days regression set in before June 8, at which time males under normal conditions are at complete sexual activity.

Modification of mammalian sexual cycles.—III, Reversal of the cycle in male ferrets (Putorius vulgaris) by increasing periods of exposure to light between October second and March thirtieth, T. H. Bissonnette (*Jour. Expt. Zool., 71 (1935), No. 2, pp. 341–373, pls. 3*).—Continuing the series noted above, the sexual cycle of male ferrets was reversed by providing additional light exposure from October 2 to March 30. Spermatogenesis with metamorphosed sperms was evident from November 7 through December, followed by regression at the end of March.

A case of probable superfetation in the cat, J. E. Markee and J. C. Hinsey (*Anat. Rec., 61 (1935), No. 2, pp. 241–251, figs. 5*).—A probable case of superfetation in the cat is noted in which two normal kittens were born and 13 days later two more were delivered. Histological examination of the uterus suggested that the first two fetuses were in one horn of the uterus and the other two in the other horn. The continuance of the pregnancy in one horn of the uterus with involution in the other suggests the operation of some local factor for the continuance of the pregnant state in addition to the role of hormones.

X-ray sterility in the male house mouse, G. D. Snell (*Jour. Expt. Zool., 65 (1933), No. 3, pp. 421–441*).—Studies of the influence of X-rays on the male house mouse showed that mitoses disappeared from the testes of the males at about 11 days after treatment with 800 R-units, but that the treatment had little or no effect on the survival of the spermatozoa in the epididymis. Motile sperm were present in a pair killed 49 days after X-raying, but none were present in the pair killed 53 days after the X-ray treatment. X-rayed mice remained fertile for approximately 10 to 14 days after treatment, but the size of the litters was reduced. No modification of the sex ratio was noted among the progeny of X-rayed males, but a high percentage of stillbirths occurred. An embryological study showed that the small litter size produced by X-rayed males was due to the death of many of the embryos at or shortly after implantation.

FIELD CROPS

[Field crops experiments in Georgia] (*Georgia Sta. Rpt. 1935, pp. 8–18, 23, 41–43, figs. 5*).—Continued agronomic research (E. S. R., 71, p. 762) at the station and the Mountain Substation included variety tests with soybeans and potatoes; a trial of flax; breeding work with oats, wheat, and soybeans; effects of fall application of nitrogen on wheat varieties of different maturity; effect of awns upon barley yields; effects of rainfall upon potato yields; planting tests with soybeans; interplanting summer legumes in corn; green manures for corn; hay yields of cowpeas, sorgo, and soybeans after small grain; and comparison of crop yields in rotation v. continuous culture. Work with cotton considered development of one-variety communities, green manure v. sodium nitrate, quantities and formulas of fertilizers, use of minor elements in fertilizers, sources of phosphorus and nitrogen, use of limestone with ammonium sulfate in fertilizer, boron requirements and functions, and mopping cotton with a molasses-calcium arsenate mixture for bollweevil control. Certain lines of work were in cooperation with the U. S. Department of Agriculture.

[Field crops work in Pennsylvania], O. OLSON, H. B. MUSSER, C. F. NOLL, and C. J. IRVIN (*Pennsylvania Sta. Bul. 320 (1935), pp. 12, 13, 14, 15*).—Progress results are reported briefly from breeding work with oats and tobacco; variety tests with alfalfa, soybeans, wheat, oats, and barley; and fertilizer and quality tests with tobacco grown in different rotations.

Mechanical aids to crop experiments, H. J. KEMP (*Sci. Agr., 15 (1935), No. 7, pp. 488–506, figs. 17*).—Seeding machines developed at the Swift Current (Saskatchewan) Experiment Station include rod-row seeders of the 9-in. circular hopper (fluted ring) and endless belt types, and a calibrated fluted drum type of continuous row seeder. The merits of seeding by weight v. numbers of viable kernels and hand seeding v. machine seeding were compared. Harvesting machines described include a rotary shear rod-row cutter, a rod-row thresher, and a head thresher.

Improved varieties developed through the cooperative crop improvement project of the University of Nanking, H. H. LOVE (*Univ. Nanking, Col. Agr. and Forestry Spec. Rpt. 2 (1935), pp. 18, figs. 3*).—Crop varieties improved in the project in cooperation with Cornell University et al. (E. S. R., 72, p. 756) included Nanking 2905 wheat, described by T. H. Shen; Nanhsuchow 61 wheat, by L. Y. Ma; Kaifeng 313 barley, by R. V. Pih; Nanksoy 332 soybeans, by S. Wang; acclimatized Trice and Acala cottons, by S. P. Peng; and Million Dollar cotton, described by Y. S. Chen.

Some factors affecting nodule formation on seedlings of leguminous plants, C. A. LUDWIG and F. E. ALLISON (*Jour. Amer. Soc. Agron., 27 (1935), No. 11, pp. 895–902*).—The effects of the presence of older plants, including alfalfa, soybeans, wheat, and corn, on the nodulation of either alfalfa or soybean seedlings growing in close proximity was studied in sand cultures.

Where the light intensity was not limiting, 33 positive and 15 negative results were obtained. The percentage of positive results was about the same whether the older plants were legumes or nonlegumes, but this beneficial effect of the older plants did not appear consistently and usually was much smaller than that observed by H. G. Thornton[3] with alfalfa.

In similar experiments where older plants were not present increased nodulation followed additions of sucrose and of a heavy inoculum. Small quantities of available nitrogen sometimes were slightly beneficial, but larger quantities greatly depressed nodule formation. Cold water extracts of sand in which alfalfa, corn, and wheat seedlings had been growing did not appreciably affect nodule formation when added to cultures of alfalfa seedlings. The favorable effect of older plants on nodule formation seems to be explained by the extreme favorableness of the rhizosphere to bacterial growth, this in turn being due in part to liberation of the essential bacterial growth substance from the roots. The practical importance of this effect under field conditions is probably negligible.

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[3] Roy. Soc. [London], Proc., Ser. B, 104 (1929), No. 732, pp. 481–492, pl. 1, figs. 7.

The magnesium content of grasses and legumes and the ratios between this element and the total calcium, phosphorus, and nitrogen in these plants, H. A. DANIEL (*Jour. Amer. Soc. Agron., 27 (1935), No. 11, pp. 922–927*).—The total magnesium content and the ratios between the total calcium, phosphorus, and nitrogen were studied at the Oklahoma Experiment Station in 162 mature plants and in the tops and roots of 40 samples of legumes collected at different growth stages.

The magnesium content of the 19 species of mature grass averaged 0.156 percent and that of the 45 mature legumes 0.379 percent. The grass varied in magnesium content from 0.059 to 0.316 percent and the legumes from 0.329 to 1.024 percent. Legumes were found to contain 2.43 times as much magnesium as the grasses. The data showed that the magnesium content of legumes decreased as the plants matured. The calcium-magnesium ratios varied in the mature grasses and legumes from 1.10 to 5.46, the phosphorus-magnesium ratios from 0.09 to 2.42, and the nitrogen-magnesium ratios from 2.09 to 22.06. The average of these ratios was slightly higher in the legume tops collected at different growth stages than in the roots. Very little relation was found to exist between the chemical composition of the tops of the plants and of the roots. See also an earlier note (E. S. R., 71, p. 621).

Combinations of corn and soybeans for silage, R. G. WIGGANS (*[New York] Cornell Sta. Bul. 634 (1935), pp. 34, figs. 7*).—Continued experiments, now reported for the period 1922–34, resembled those noted earlier (E. S. R., 69, p. 202) in general scope and in conclusions based on the results. Since then more attention has been paid to varieties and the optimum rates of planting the two crops. Observations in addition to conclusions already noted may be stated as follows:

Any one of several varieties of soybeans grown in the same row with a good silage corn increased significantly the total dry-matter production per unit area. For example, Wilson soybeans, when grown with Cornell 11 corn over 11 yr., resulted in an average increase of 14.2 percent in total dry matter. Haberlandt, Illinois 13-19, Midwest, Mansoy, Wilson, Dunfield, and Peking probably surpass either Black Eyebrow or Manchu, all of which give significant increases in total dry matter. Virginia and Biloxi are deemed too late in maturity for satisfactory performance. Cayuga (E. S. R., 72, p. 42), because of its extreme earliness and short growth habit, is considered unsuitable for a silage variety. Pole beans (E. S. R., 73, p. 35) cause a very material loss in total dry-matter production when grown with corn for silage. Any good silage corn and a suitable variety of soybeans, grown together in the same row and spaced at the rate of one corn to three soybean plants in each 9 in. of row, yield more digestible nutrients than does the same corn grown alone at the optimum planting rate, and likewise the nutritive ratio is narrowed materially as a result of the high protein content of the soybeans.

Pollination studies in toria (Brassica napus L. var. dichotoma, Prain) and sarson (Brassica compestris L. var. sarson, Prain), A. MOHAMMAD (*Indian Jour. Agr. Sci., 5 (1935), No. 2, pp. 125–154*).—The report on the pollination work is supplemented by comments on the status of *toria* and *sarson* as oil seed crops and breeding for improved varieties. Observations in addition to those recorded earlier (E. S. R., 66, p. 328) are as follows:

Self-pollinating a flower bud 2 and 3 days before opening gave good pod setting and seed production. Flowers self-pollinated 2 or 3 days after opening set pods and produced seeds much better than those produced on the same day or the day after opening. The probable cause of self-sterility seems to be the slower growth of "self" pollen than of the foreign pollen in the stylar tissue. This is attributed to an inhibiting action which may be due mainly to the effect of a secretion produced actively in the stylar tissue between 1 to 2 days before and after flower opening. Pollen grains remain viable for at least 7 days, and the stigmas remain receptive for 3 days after flower opening. In *toria*, number of primary branches, length of pods, and weight of seeds were found to be more or less positively correlated with yield of plants. Due to loss of vigor in *toria* and brown-seeded *sarson* by inbreeding, pure lines are thought to have no direct economic utility, but considerable improvement has been achieved by mass selection. Self-sterility was found to behave as an inherited character independent of seed color, and self-compatible brown-seeded plants were evolved. *Andrena ilerda*, *Apis florea*, and *Halictus* sp. were observed to be the chief insect pollinators of *toria* and *sarson*.

The growth, yield, and composition of certain tropical fodders, D. D. Paterson (*Jour. Agr. Sci.* [*England*], *25* (*1935*), *No. 3*, *pp. 369–396*, *figs. 3*).—Elephant grass, Uba cane, and Guatemala grass were compared under Trinidad (British West Indies) conditions and efforts made to ascertain for each the correct cutting stage for maximum nutritive value per acre. The experiment comprised a yield trial in the form of a Latin square embracing main plats harvested every 45, 90, 120, and 180 days, respectively, with the 3 varieties on subplats. This work supplemented previous cutting tests with elephant grass (E. S. R., 71, p. 187).

On the average the yields of either herbage or dry matter tended to increase as the cutting rotation was prolonged up to 6 mo. Yields were about in the proportions: Uba cane, 100; Guatemala grass, 81.2; and elephant grass, 48.3 percent. The lower yield of elephant grass was attributed to an attack of *Helminthosporium* sp. on its foliage. For each variety individually, cutting as often as every 45 days decreased productivity, while the 6-mo. cutting rotation gave a significant increase with Uba cane and Guatemala grass but with elephant grass a significant decrease in total yield. The height of herbage when cut was correlated positively with yield and cutting rotation, i. e., the greater the yield and the longer the rotation the taller the grass.

Elephant grass was about 2 to 3 percent lower in dry matter content than the other grasses. In each variety, progressive gains in dry matter and decreases in protein percentage occurred from the shortest to the longest cutting treatment. Elephant grass was significantly better and Uba cane poorer in protein than Guatemala grass. The maximum nutritive value per acre for each grass, as estimated from the total protein yield, was obtained from the 3-mo. cutting rotation.

Field observations revealed that sprouting of ratoons can occur by bud or terminal development of tillers or both, the predominating method depending primarily upon length of cutting rotation. Simultaneous development by both methods is desirable for a quick cover and dense herbage and with Guatemala grass occurs on the optimum cutting rotation of 3 mo. The land was cleaner from weeds as the cutting rotation was the longer. Guatemala grass was the best and elephant grass the poorest weed eradicator. These grasses, especially Uba cane, could successfully withstand drought. The short cutting rotations were associated with smaller, less vigorous stools and decreased root development.

A marked positive correlation between rainfall and productivity and a negative one between rainfall and dry matter percentage were noted, but the negative correlation between number of inches of rain and protein content noted in the earlier experiment was not present, probably because of long drought. Fodder research under tropical and temperate conditions is compared.

The effect of fertilizers on the longevity of mowings, A. B. Beaumont, R. W. Donaldson, and M. E. Snell (*Massachusetts Sta. Bul. 322 (1935), pp. 8*).—When top-dressed with various mixed fertilizers, an old meadow on a Merrimac fine sandy loam was improved in quality and yield by mixtures high in nitrogen and potash, whereas little or no benefit was derived from superphosphate. Fertilizer with nitrogen, phosphoric acid, and potash in a ratio of about 3:1:2 is recommended for old meadows on soils of this type. On soils of this and closely related types the quality of mixed grass meadows will so deteriorate in 6 or 8 yr., in spite of rational fertilization, that reseeding is desirable. In another experiment on a similar soil where 4 different nitrogen carriers were applied as top-dressing to furnish nitrogen at the rate of 50 lb. per acre, the increase due to fertilizer was a little over 100 percent, but data were too limited for conclusions on the relative merits of the materials used.

The total nitrogen content of the grass was found to decrease as maturity advanced. In the earliest growth stage nitrogen fertilizers increased the nitrogen content about one-fourth to one-half, while in the last stage the fertilized and unfertilized grass differed little in nitrogen percentage.

The relation of pasture development to environmental factors in South Australia, H. C. Trumble (*Jour. Dept. Agr. So. Aust., 38 (1935), No. 12, pp. 1460–1487, pl. 1, figs. 16*).—Pasture improvement work in South Australia is discussed in regard to location, nature, and carrying capacity of grazing areas; pasture types; response of natural pastures to fertilizers and to rainfall; relations of type to environment, and of seeded pastures to climatic and soil factors; interrelations of phosphatic and nitrogenous fertilization with competition and yields; and seeds mixtures adapted to different conditions.

Evidence of field hybridization in beans, W. W. Mackie and F. L. Smith (*Jour. Amer. Soc. Agron., 27 (1935), No. 11, pp. 903–909*).—Evidence presented from this contribution from the University of California showed field hybridization to occur commonly in all 6 species of beans grown in California, viz, common beans (*Phaseolus vulgaris*), tepary beans (*P. acutifolius*), *multiflorus* or butter beans (*P. coccineus*), small or baby lima (*P. lunatus sieva*), large lima (*P. lunatus macrocarpa*), and blackeye cowpeas (*Vigna sinensis*). Such cross-pollination usually takes place between adjacent plants. Variation in size and color of the seed and vigor and maturity of the vines, as in the case of the Salinas Pinks, have resulted from field hybridization between vines within a variety. Disease resistance characterizing a variety may be disturbed or broken down. The western grass thrips (*Frankliniella occidentalis* (Pergande)), rather than bumblebees or honeybees, appeared to be responsible for the field hybridization in beans.

Investigations in crop husbandry.—II, On the age of seed beans, F. H. Garner and H. G. Sanders (*Jour. Agr. Sci. [England], 25 (1935), No. 3, pp. 361–368*).—In the second of this series (E. S. R., 68, p. 41), new and old seed beans were compared and data were reduced by a method noted earlier (E. S. R., 71, p. 460). In general, new seed yielded higher than old seed but only by about 10 percent. There were some indications that harvest conditions might be more important than age of seed. New seed produced more branches in early spring and more pod-bearing stems at harvest, but old seed produced stems more thickly podded at harvest and pods with more beans. In one test abnormally large seed produced very vigorous plants and very large beans at harvest.

The improvement of naturally cross-pollinated plants by selection in self-fertilized lines.—II, The testing and utilization of inbred strains of corn, D. F. Jones and W. R. Singleton (*Connecticut* [*New Haven*] *Sta. Bul. 376* (*1935*), *pp. 649–691, figs. 17*).—The findings reported in the second part of this work are held in general to corroborate previous conclusions (E. S. R., 53, p. 629).

In two sets of experiments with both Burwell Yellow Flint and Leaming Dent, inbreds were classified, before crossing, as good or poor in one case and as productive, intermediate, and unproductive in another. In no case were highest average yields obtained from strains classified as unproductive, and the opposite also held true. In matings of good and poor inbreds, good × good yielded highest, good × poor intermediate, and poor × poor lowest, although the differences were not significant. In double crosses combining from none to 3 good strains there was a barely significant increase in the crosses having 3 good strains over those with none. Specific characters in the inbred parents that appeared in the F_1 hybrid were short, long slender, cylindrical, and tapering ears. In a series of white flint corn inbreds, all crossed by a multiple Leaming variety, selection of best inbreds was of little avail. One-half of the most productive crosses was obtained by choosing one-third of the best inbreds before crossing. It is doubtful if any normal lines should be eliminated before crossing.

In Evergreen sweet corn the most productive F_1 hybrid had a serious root weakness, contributed largely by the C-63 parent. In an effort to correct this, remnant seed from 3 progenies in the second generation of lines No. 50 and No. 63 were grown, and sixty-one new lines were started; these were selfed for three generations, always using erect plants; and the new No. 50 lines were then crossed with the new No. 63 lines and the F_1 hybrids tested. No hybrids were found that were materially better than the original cross, which emphasized the futility of carrying on many lines after the plants are selfed for two generations. It probably would have been better to start a great many lines and to carry on only one progeny from each originally selfed plant.

In a series of Whipple sweet corn inbreds in which 106 lines were started, 23 of 74 lines remaining after three generations of selfing were noted as promising in stalk growth or ear characters. All but one of the best F_1 hybrids resulted from crossing these 23 inbreds in various combinations; the remaining inbreds could have been profitably discarded. In the Whipple series, positive correlations of inbreds and F_1 hybrids were found between number and weight of ears and number of tillers per plant, and between number of tillers and yield of marketable ears. Selection of inbreds with many tillers is advisable provided the tillers do not produce ears.

Each of the methods for testing good inbreds is discussed. Inbreds can be tested by crossing with other inbreds (single cross), by crossing an F_1 hybrid × an inbred (3-way cross), by crossing two F_1 hybrids together (double cross), by crossing later generation hybrids together (advanced generation cross), by crossing an inbred by a variety (top-cross), or by crossing two synthetic varieties together (multiple cross).

Many inbred lines can be produced with minimum effort by growing only one hill of each line. This method, as described, proved advantageous in isolating good inbred lines of Spanish Gold, an extra early sweet corn.

F_1 hybrids heterozygous for *Gg* (golden plant character) did not differ in yield from similar hybrids of *GG* composition.

When crossed seed of the same inbred parents was produced under widely different conditions of latitude and climate, no differences in yield of the F_1 hybrids were obtained when all lots were grown in Connecticut (E. S. R., 74, p. 30).

Flaxseed production in the North Central States, A. C. Dillman and T. E. Stoa (*U. S. Dept. Agr., Farmers' Bul. 1747* (*1935, pp. II+18, figs. 11*)).—The information given on the history of flax in the United States, its cultural status, varieties, cultural methods and field practices, rotations, weed control, growing flax and wheat as a mixed crop, and flax under irrigation, diseases of flax, cleaning and storing seed, and the marketing and utilization of the seed crop, is a revision of that included in Farmers' Bulletin 1328 (E. S. R., 52, p. 437) which it supersedes. The data included were largely obtained in cooperation with the North Dakota Experiment Station.

Markton and other varieties of oats, O. E. Barbee (*Washington Sta. Bul. 314* (*1935*), *pp. 44, figs. 18*).—The comparative yields, adaptations, and other varietal characteristics of oats varieties, determined in prolonged plat and nursery tests, are reported in continuation of earlier work (E. S. R., 51, p. 37) with comparisons of the production of oats and other cereals, and the relation of oats production to horses and mules.

Markton, recommended for eastern Washington, has immunity from known forms of oat smut, good yields, high bushel weight, a low percentage of hulls, and medium-early maturity. Victory is indicated for the lowlands of western Washington because of its high yield and stiff straw, although Markton yielded well on the uplands there and has the advantage of immunity from smut. Gray Winter, the only oats in general used for fall seeding, can be sown alone or with peas or vetch for hay and silage. All oats except Markton need treatment for smut before planting. The best control was obtained from the formaldehyde dip method.

Correlation studies showed that date ripe was not correlated with yields, indicating that factors other than time of maturity influence yield. However, the latest group was lowest in yield. Date of maturity also had no effect on bushel weight. Shattering was not correlated with yield but was so associated with date ripe that varieties ripening in midseason shattered the most. High-yielding varieties did not lodge as much as lower yielders, indicating that yield is correlated with stiff straw. The taller varieties also lodged slightly less than the shorter ones. Low percentage of groats was associated with poor quality of oats and low bushel weight. Kernel size did not influence yield but was slightly associated with bushel weight. The grain: sheaf weight ratio for hull-less varieties was considerably lower than for the hulled oats. The oats of the side type of panicle tested produced 18.5 percent less yield per acre than tree type oats.

Oats production in Washington reached its peak in 1910, dropping during the next 15 yr. to almost the 1900 level, and gradually increasing since 1930. This drop in oats production seemed due in a measure to the decline in the number of horses and mules, replaced by tractors. The increase in oats production during the depression may be due to the return of these animals in the oats sections.

Thermal conductivity of stored oats with different moisture content, A. L. Bakke and H. Stiles (*Plant Physiol., 10* (*1935*), *No. 3, pp. 521–527, fig. 1*).—Iowa Experiment Station studies supplementing previous work (E. S. R., 70, p. 176) showed that the thermal conductivity of dry oats has a value of about 0.000153 and increases directly with the moisture content. At a moisture content of 9.88 percent the thermal conductivity was 0.000153 and at 38.32 percent 0.000222 in c. g. s. units.

Oil formation in groundnut with reference to quality, J. S. Patel and C. R. Seshadri (*Indian Jour. Agr. Sci., 5 (1935), No. 2, pp. 165–175, figs. 2*).—As the peanut seed developed in studies at Madras the percentage of oil gradually increased except in the stages just after blooming and just before maturity. As the seed develops, gains occur in oil content and shelling percentage and reductions in the free fatty acid and moisture content. Harvesting peanuts even one week before full maturity increased the free fatty acid content and reduced the oil content of kernels by about 5 percent. The practice of harvesting peanuts before fully mature was observed to increase the proportion of immature kernels and the period required for drying, and thus to increase the chances of deterioration which would be accelerated when the crop was wet.

Factors influencing the growth and yield of potatoes in Florida, M. R. Ensign (*Plant Physiol., 10 (1935), No. 3, pp. 465–482, figs. 9*).—A series of time of planting tests made by the Florida Experiment Station, 1927–31, demonstrated that considerable latitude is admissible in time of planting potatoes in the LaCrosse and Hastings areas, ranging from December 15 to February 14, the January 16–31 period giving the largest average yields. The stolon formation period from about 28 to 50 days after planting appeared to be critical in development as measured by yield of primes, reaching its peak about 35 to 40 days after planting. The soil moisture content during this period seemed to be the chief factor affecting yields, the optimum being about 12 to 13 percent on an oven-dry basis. Better drainage at Hastings and need for irrigation at LaCrosse were indicated by the respective soil moisture contents.

March seemed to be critical for the average planting, since it approximates stolon formation. For Hastings a warm, relatively dry period extending from late February through March favors large yields, and vice versa. Temperature effects seem of lesser importance in influence upon yields, although there was evidence that temperatures prevailing during January and April are too high while March temperatures are too low for maximum yields. March temperatures tend to be below normal when the precipitation is above normal, both of these factors being inimical to large yields. There are 4 periods or cycles in March rainfall of approximately 30, 15, 10, and 7.5 yr., respectively. The last 2 have recurred over the past 60 yr. so that the wet Marches show 199 and 233 percent increase of rainfall, respectively, over corresponding dry years. When potatoes are planted during January 16–31 the critical period of stolon formation follows the period of greatest freezing frequency, and therefore reduces the chance of low yields due to freezing injury.

Polyembryony in rice (Oryza sativa), K. Ramiah, N. Parthasarathy, and S. Ramanujam (*Indian Jour. Agr. Sci., 5 (1935), No. 2, pp. 119–124, pls. 2*).—Polyembryony occurred fairly often at the Coimbatore Paddy Breeding Station in a pure line T. 24 and in several hybrid progenies, T. 24 alone showing it consistently in the proportion of 1 in 1,000 seeds. Seeds giving rise to 2 seedlings were the more common, yet some producing triplets were also noted. Among genetically identical twins, besides the normal green, some lethal albino twins were observed. Genetically different twins included cases where a haploid was found associated with a diploid and a green seedling with an albino. Indications were that polyembryony is a heritable character. The occurrence and breeding behavior of some of the twins are discussed in relation to the origin of polyembryony in rice.

Soybean production in Idaho, H. W. Hulbert and H. L. Spence (*Idaho Sta. Bul. 218 (1935), pp. 13*).—Varieties, cultural and field methods, and irrigation practices are suggested for growing soybeans in Idaho, based on experiments made at different times since 1914 and on experience. Soybeans are adapted to the warmer areas of the State, especially in sections where corn can be cured properly. Their successful production in Idaho depends upon the choice of adapted varieties. Idaho-grown seed was found to be superior to that imported from States in the Middle West. Row plantings in hills or drills rather than broadcast seeding and also inoculation appeared essential for success with the crop, which can be grown with the same cultural practices required for corn or navy beans. The uses and feeding value of soybeans and their byproducts are discussed briefly.

Field experiments with sugar cane, IV, C. H. B. Williams, R. R. Follett-Smith, and C. Cameron (*Brit. Guiana Dept. Agr., Sugar Bul. 4 (1935), pp. [9]+121, figs. 41*).—Sugarcane experiments in British Guiana (E. S. R., 72, p. 178) in the year ended June 30, 1935, continued to show the current superiority of the Diamond 10 and P. O. J. 2878 varieties and good characters of other promising canes, especially new seedlings. The response of D. 625 plant cane and ratoons on flooded and unflooded soils to ammonium sulfate is detailed, with recommendations for different situations. Ammonium sulfate surpassed other nitrogen carriers, and heavy applications did not have a significant residual effect or do better when divided. Responses to lime, phosphate, and potash also are mentioned.

Flood-fallowing, i. e., flooding the field for 4 mo. to 2 yr. after the last ratoons are harvested, was found better than grass-fallowing on frontland soils. Water depth and presence or absence of vegetation were of minor importance. Addition of 5 tons per acre of molasses to the flood water gave in the plant cane yield increases enough to pay for the molasses. The 6-mo. and 12-mo. flood-fallows gave 12 and 24 percent, respectively, increase in sucrose per acre over the 4-mo. flood-fallow.

Some observations on the seed-setting in a type of tobacco, K. Ram (*Indian Jour. Agr. Sci., 5 (1935), No. 2, pp. 355–357, pls. 2*).—During the cold weather with the short daylight in December and January, few capsules were formed in Pusa Type 56 tobacco but the number increased in the succeeding months with longer days and higher temperature. Reciprocal crosses between Type 56 and Type 63, which sets capsules well throughout the season, indicated that the cause lies in the defective functioning of pollen of Type 56 during short duration of daylight and at low temperature.

Portuguese wheats (study on their distribution) [trans. title], A. da Cunha Monteiro (*Estaç. Agr. Cent. [Lisboa] Bol. 17 (1935), Ser. A, pp. 89, figs. 31*).—The distribution and agronomic characteristics of the principal varieties of wheat grown in Portugal are discussed in some detail, with notes on the industry in different areas.

Seed list (*U. S. Dept. Agr., Bur. Plant Indus., 1935, pp. 32*).—This is a list of the common and scientific names of forage plant seeds and the incidental seeds commonly found with them.

Photographs of drawings of seeds: The more important forage-plant seeds and incidental seeds commonly found with them, F. H. Hillman and H. H. Henry (*U. S. Dept. Agr., Bur. Plant Indus., 1935, pp. 19, pls. 15*).—A list of the common and scientific names accompanies the plates.

Results of seed tests for 1935, B. G. Sanborn and L. J. Higgins (*New Hampshire Sta. Bul. 286 (1935), pp. 20*).—The percentages of purity and germination are tabulated for 391 official samples of field crop seed collected from dealers in New Hampshire during the year ended June 30, 1935.

Agricultural seed, A. S. Lutman (*Vermont Sta. Bul. 398 (1935), pp. 16*).—The germination and purity guaranties and important variations therefrom are tabulated and discussed for more than 600 samples of agricultural seed collected from dealers in Vermont during 1935.

Study of Japanese weed seeds.—I, Grasses [trans. title], M. Kondo, Y. Kasahara, and Y. Terasaka (*Ber. Ōhara Inst. Landw. Forsch., 6 (1935), No. 4, pp. 525–538, figs. 15*).—The characteristics of the seeds of 15 species of weed grasses are described and illustrated.

Germination of Russian pigweed seeds in ice and on frozen soil, O. S. Aamodt (*Sci. Agr., 15 (1935), No. 7, pp. 507, 508, fig. 1*).—The germination of seeds of *Axyris amaranthoides* under extreme conditions in the field in Alberta is reported.

Factors influencing the effectiveness of sodium chlorate as a herbicide, A. S. Crafts (*Hilgardia [California Sta.], 9 (1935), No. 9, pp. 437–457*).—Chlorates may kill deep-rooted perennial weeds by rapid absorption and translocation within the plant, and by absorption from the soil by the roots. The experiments reported on serve to establish the relative importance of these two methods.

The daytime spraying of 25 cc of 10 percent sodium chlorate solution on the foliage of greenhouse plants of morning-glory, Russian knapweed, and hoary cress in blossom, with ample soil moisture, differed little in effect from simple removal of tops by cutting. Applying the same amount of chlorate to the soil killed the morning-glory and Russian knapweed but only injured the hoary cress. Plat experiments during 3 winters showed that proper vertical distribution of chlorate within the soil by leaching of winter rains is essential to success with the soil-treatment method. Indications were that a similar vertical distribution may be accomplished by leaching with irrigation water. The rapid absorption and translocation of chlorate through plants appeared to be conditioned by the same factors that control the action of acid arsenical spray.

Experiments designed to kill plants by chlorate action through the plant, through the soil, and through both the plant and the soil, indicated that the third method is the most effective. Pretreatments aimed at a weakening of plants, including hoeing, or spraying with sodium chlorate 2 percent, sodium arsenite 0.5 percent, or Diesel oil decreased rather than increased the effects of chlorate. Acid arsenical treatment in July, however, followed by chlorate in December, was very effective, the July treatment killing the roots down to 3 ft. or deeper. Fall sprays, applied in a number of ways against morning-glory, were all effective except a spray followed immediately by irrigation that washed the chlorate into the soil, leaving the foliage intact. Division of the dose into 2 and 3 separate applications was not of additional benefit in these experiments, either in the fall or winter treatments, although in winters of high rainfall this method might avoid excessive loss. Winter treatments were effective as long as the bulk of the chlorate was applied early enough to be leached well into the soil, but late applications failed. Hoeing plants injured severely by chlorate absorbed from the soil weakened them and proved a practical means of increasing the effects of a given treatment. Continuous leaching with irrigation water was the best means of ridding the land of residual chlorate; sterile areas leached with 36 in. of water were returned to use within a season.

The toxicity of sodium arsenite and sodium chlorate in four California soils, A. S. Crafts (*Hilgardia [California Sta.], 9 (1935), No. 9, pp. 461–498, figs. 18*).—The behavior of sodium arsenite and sodium chlorate in Yolo clay loam, Stockton adobe clay, Fresno sandy loam, and Columbia fine sandy loam was studied to gain information on the merits of sodium arsenite as a soil sterilant and sodium chlorate for soil treatment, both in weed control.

Compared with several soil sterilants on a cost basis, trivalent arsenic proved to be the most feasible chemical for soil sterilization. The toxicity of arsenic was greatest in Fresno sandy loam, lowest in Yolo clay loam, and intermediate in Stockton adobe clay and Columbia fine sandy loam. The loss of toxicity with time and cropping was greatest in the Yolo soil, lowest in Fresno sandy loam, and intermediate in the other two soils. Yolo clay loam had the strongest fixing power for arsenic, being able to hold over 4 times as much as Fresno sandy loam from solutions of equal concentration. The Stockton and Columbia soils held somewhat over twice as much. The amount of arsenic held by all 4 soils was greater with increased concentration of the solutions applied.

The strong fixing of arsenic in the Yolo clay loam was also shown in leaching tests. After movement of 160 surface centimeters of water through the soil, the top 4 in. was still sterile, and the chemical had not gone down below the 16-in. level. Arsenic moved down through Stockton adobe clay more readily with leaching. With 160 surface centimeters of leaching, toxicity decreased in the top 4 in., but the remainder of the column was sterile. Columbia fine sandy loam was intermediate between the Yolo and Stockton soils in the leaching tests. Fresno sandy loam showed the lowest fixing power, leaching with 160 surface centimeters of water practically removing the toxicant from the soil column.

Toxicity of sodium chlorate was highest in Stockton adobe clay, lowest in Yolo clay loam, only slightly higher in Columbia fine sandy loam, and intermediate in Fresno sandy loam. Loss of toxicity with cropping was greater with the third crop than with the second, probably being related to the increasing temperature as the season advanced. The fixing power of the 4 soils was much less for chlorate than for sodium arsenite.

In Yolo clay loam more chemical was fixed from a slowly moving solution, while rate of moistening had no effect in Fresno sandy loam. The Yolo and Columbia soils could hold the chemical within the top halves of 36-in. columns from solutions up to 400 p. p. m. in concentration; in the Fresno soil it penetrated through nine-tenths of the columns. The Stockton soil apparently has no fixing power for sodium chlorate. Chlorate toxicity was higher in columns previously moistened with distilled water than in those moistened only with the chlorate solutions. Leaching with distilled water moved the chlorate downward in the soil columns, 40 surface centimeters of water sufficing to remove the chlorate from the Yolo and Columbia soils, and even less water required to leach the other 2 soils free of chemical.

Sodium chlorate was present in the top 20 in. of the soil from sterile areas sprayed 3 yr. before to kill morning-glory. Leaching with 36 surface inches of irrigation water successfully removed the chemical, and alfalfa was seeded subsequently without toxic effect apparent during the first year.

HORTICULTURE

[Horticultural studies by the Georgia Station] (*Georgia Sta. Rpt. 1935, pp. 31–35, 36, 37–41, fig. 1*).—Herein are presented briefly the results of studies of peach fertilizers and varieties; muscadine grape varieties, seedlings, and propagation; bramble varieties; culture of the red raspberry; growing of tung-oil trees; the Methley plum; tomato fertilizers and varieties; and variety tests at the Mountain Substation of various fruits and vegetables.

[Horticultural studies by the Pennsylvania Station] (*Pennsylvania Sta. Bul. 320 (1935), pp. 20, 24–26*).—Brief reports are presented on the following subjects: Synthetic composts for mushrooms, by J. W. Sinden; use of glass in greenhouses that transmits ultraviolet radiation, by H. W. Popp; ringing apple trees, by F. N. Fagan; soil fertility in the apple orchard, by R. D. Anthony and J. W. White; synthetic nitrogenous fertilizers for apples, by Anthony and R. H. Sudds; head lettuce, by M. T. Lewis; winter cabbage, by C. E. Myers; Penn State, a new early tomato, by Myers; fertilizers for truck crops on Hagerstown soils, by W. B. Mack; varieties of sweet corn, including analyses by Myers, Lewis, and E. S. Erb; and dependable roses, by R. P. Meahl.

Analyses of materials sold as insecticides and fungicides during 1935, C. S. Cathcart and R. L. Willis (*New Jersey Stas. Bul. 594* (*1935*), *pp. 16*).—In the usual manner (E. S. R., 72, p. 617) information is presented on the results of analyses.

Vegetable varieties for the winter garden region of Texas, L. R. Hawthorn (*Texas Sta. Bul. 508* (*1935*), *pp. 139, figs. 19*).—During the period 1930–34 there were tested 590 varieties representing 49 kinds of vegetables. Information is presented on the adaptability of the respective varieties to the locality and on their distinguishing characteristics. Data are also given on the relative resistance of a number of vegetables to a low temperature of 18° F. occurring in February 1933.

Root development of beans, cabbage and tomatoes as affected by fertilizer placement, C. B. Sayre (*Amer. Soc. Hort. Sci. Proc.*, *31* (*1934*), *pp. 564–571, figs. 4*).—Observing in field trials that wherever fertilizer was applied in bands along the rows the plants developed many finely branched feeding roots that tended to completely permeate the fertilizer, an experiment was set up in the greenhouse at the New York State Experiment Station in which bean seed and bean seedlings were planted in different positions and at different time intervals following the placement of the fertilizer. When planted directly over the band and immediately after fertilizer placement, there was 100 percent killing of transplants. Planted as little a distance as 0.5 in. away from the band, there was little injury irrespective of the time of planting. Seedlings set directly over the band 4 days after fertilizer placement showed 100 percent survival even when 600 lb. per acre of a 4–16–4 material were used. More time between fertilizer placement and planting was required to prevent serious losses in the case of seed planted directly over the bands than was true with the transplants. When the rate of fertilizer application was reduced to 75 lb. per acre, there was little injury to germination in any instance.

Analyses of the 4–16–4 fertilizer recovered from the soil 2, 4, 6, 8, and 12 days after placement showed that the soluble salts diffuse rapidly through the soil solution; in fact in 2 days ⅝ of the inorganic nitrogen, ⅔ of the potash, and ¼ of the phosphorus had diffused. After 4 days in the soil the residue had become alkaline, despite the fact that originally 303 lb. of calcium carbonate per ton were required to correct acidity. The author states that soil moisture had obviously a marked effect on the rate of diffusion of the soluble fertilizer salts.

Summary of performance records of individual plants of Mary Washington asparagus, G. C. Hanna (*Amer. Soc. Hort. Sci. Proc.*, *31* (*1934*), *p. 493*).—Observations by the California Experiment Station on individual plants of the Mary Washington variety showed great variability in yield and type of shoots, the yield varying from practically 0 to 700 or 800 percent of the average. Low yielders, as a rule, produced only a few large spears with female plants predominating. Male plants with a large number of small spears also occurred among the low producers. High yield, mostly in male plants, was characterized by the production of many medium to large spears. Differences were noted in the cross section shape of the spears, earliness of production, compactness of the head, and color. Very early plants were predominantly males. Spears with purple overcast were less desirable for canning, not only on account of color but also because of a stronger and more bitter flavor.

The effect of blanching on quality of asparagus, J. P. McCollum (*Amer. Soc. Hort. Sci. Proc., 31 (1934), p. 487*).—Comparisons by the Illinois Experiment Station of asparagus shoots grown naturally with those blanched by soil or by covering with inverted containers showed the normal green shoots to be higher in dry matter, alcohol insoluble residue, and protein nitrogen, and lower in total sugars. In general the shoots beneath inverted containers were intermediate in composition. The cell walls of the pericyclic fibers were much thicker in soil-blanched than in the shoots of the other two treatments.

Results from hybridizing cabbage with brussels sprouts, T. M. Currence (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 485–487*).—At the Minnesota Experiment Station F_1 plants from crosses of cabbage and brussels sprouts were backcrossed to both parents. The back-cross to the brussels sprouts parent yielded four promising brussels sprout type parents in a population of 236, as compared with only one promising plant in 96 individuals obtained by selfing the F_1. From the results the author concludes that back-crossing the F_1 to the brussels sprouts parent provides the most promising material for obtaining desirable types of brussels sprouts.

Progress in developing muskmelon strains resistant to Fusarium, T. M. Currence and J. G. Leach (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 481, 482*).—Self-pollination by the Minnesota Experiment Station of Bender Surprise plants growing in a field of Fusarium-infected soil yielded one population which exhibited considerable resistance as compared with adjacent commercial varieties. Further selections and selfing in the resistant stock suggested that the original parent may have been a cross between Bender Surprise and Honeydew, since both types appeared among the seedlings. Some of the seedlings, Honeydew-like in appearance but earlier in maturity, appeared to be highly resistant and promising.

Fertilizer requirements of sweet corn, W. A. Huelsen and M. C. Gillis (*Illinois Sta. Bul. 417 (1935), pp. 349–435, figs. 4*).—Nitrate of soda, superphosphate, and muriate of potash used singly and in various combinations were tested for sweet corn growing on a dark silt loam prairie soil in a 4-yr. rotation as follows: (1) Wheat or oats, (2) red clover, and (3) and (4) sweet corn, with the first crop of clover removed as hay.

On the whole the results indicated that sweet corn is rather critical in its plant-food requirements. Of a total of 63 treatments, four, (1) 800 lb. of a 0–16–3 (NPK), (2) 400 lb. of a 2–8–24, (3) 400 lb. of a 2–16–6, and (4) 400 lb. of a 2–16–12 material, were outstanding. Of these the fourth was the most effective. In this combination the N was applied at a later date as a side dressing.

All of the treatments mentioned hastened the maturity of sweet corn by 3 to 5 days. N alone had virtually no effect on maturity but in combination with sufficient P was effective. Of the three elements, P has the most marked influence on maturity, whether used alone or in combination. Maturity was retarded by K used alone or combined with N, but was advanced by light applications of K combined with larger amounts of P.

With respect to yields, nitrate of soda used as a side dressing without basal treatments of P or K alone or combined gave inconsistent results. N combined with P was more effective than either element used separately. Yield increases were inconsistent when N and K were used without P. Combinations of P and N or of P and K gave better results than P alone, and P gave uniformly better yields when clover was included in the rotation. The role of

K was strongly dependent upon the ratio in which it was used with the other elements, and muriate of potash used alone failed to increase appreciably yields and in many cases actually appeared harmful. P and K showed a tendency toward an inverse relationship.

Fertilizer treatments for sweet corn, W. A. Huelsen and M. C. Gillis (*Illinois Sta. Circ. 439 (1935), pp. 12*).—This is a condensed and popularized edition of the above.

How far should sweet corn grown for seed be planted from other corn to prevent contamination? E. S. Haber (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 450–452*).—At the Iowa Experiment Station a corn-producing pollen containing the factors for the production of purple aleurone was planted adjacent to Evergreen and Country Gentleman to determine the distance that crossing may occur. Under the conditions prevailing there was no heavy contamination beyond 7 rods. Light contamination extended to the ninetieth row (18 rods away), and an occasional purple kernel was found as far distant as 23 rods.

Corn-earworm resistance in maize varieties at Davis, California, 1934, C. F. Poole (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 453–457*).—Of 39 varieties of corn tested by the California Experiment Station for possible resistance to ear worm, six sweet corns, namely, Oregon Evergreen, Papago, Florida 191, Surecropper Sugar, Honey June, and Alameda, and four field corns, Mexican June, King Phillip 80, Trucker Favorite, and Snowflake, showed sufficient promise to be used in the development of local sweet varieties. Comparing April and May plantings, severer injury was observed in the May plantings of all varieties except Surecropper Sugar, Honey June, and Mexican June. Tall-growing, late-maturing varieties were found less susceptible to attack. The degree of husk projection beyond the tips was not generally associated with protection, although in six varieties an apparently significant correlation was observed.

Breeding cucumbers resistant to scab, R. M. Bailey and I. M. Burgess (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 474–476*).—Inoculation tests by the Maine Experiment Station on seedlings of 125 inbred strains derived by selfing commercial varieties showed 117 to possess no resistance to scab (*Cladosporium cucumerinum*). Two strains derived from late-maturing slicing cucumbers were free of infection. Field trials confirmed the greenhouse results. The two resistant strains continued to breed true upon repeated selfings, whereas the six showing partial resistance continued to produce segregating progeny. The results of inoculation tests of seedlings resulting from crosses between strains of different degrees of resistance indicated that inheritance of resistance to scab may be based on a single factor.

Composition of pumpkin and squash varieties as related to the consistency of the canned product, D. M. Doty, J. H. MacGillivray, and H. R. Kraybill (*Indiana Sta. Bul. 402 (1935), pp. 28, figs. 4*).—Using fruits the age of which was established by tags put on at the time of full bloom, it was found that starch and insoluble solids attain a maximum shortly before maturity, about the time that the fruits yield a pack of maximum consistency. Of four varieties, Boston Marrow and Golden Delicious squashes and Kentucky Field and Connecticut Field pumpkins, the Golden Delicious appeared highly promising the first 2 yr., yielding a high consistency product. However, in the last 2 yr. of the trials the Golden Delicious yielded a low consistency pack, indicating that environment may greatly influence the chemical composition and consistency of this variety. The other three varieties yielded rather low consistency products every year. Starch is believed more important than any other single constituent in determining consistency, and in general the higher the starch the higher the consistency. Since starch and insoluble solids decrease rapidly in storage, it is recommended that canning take place promptly after picking. It is suggested that the blending of high consistency varieties with those of low consistency offers a satisfactory means of improving the canned product.

Observations on some inbred lines of bush types of Cucurbita pepo, G. W. Scott (*Amer. Soc. Hort. Sci. Proc., 31 (1934), p. 480*).—Observations by the California Experiment Station at Davis on F_2 and F_3 lines of three varieties of *C. pepo*, namely, White Bush Scallop, Yellow Summer Crookneck, and Italian Marrow, showed that the commercial variety is heterozygous and that by selfing distinctive lines may be isolated. Vigor was reduced in the F_2 in some lines or was equal to or greater than that of the original parent in others. Self-sterility was not a factor in the varieties used. Inbreeding is recommended as a practical means of improving the three varieties.

Methods in variety trials, W. B. Mack (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 491, 492*).—At the Pennsylvania Experiment Station in the case of single plats of 25 tomato plants each, differences of 20, 40, and 33 percent in average yield were necessary to show significance in the case of total yield, yield during the first 3 weeks, and marketable yields, respectively. With 5 plats of 6 plants each carefully distributed over the field, differences in total yield of 25 percent and in early yield of 37 percent were required for significance.

Type analyses on dwarf stringless bean pods gave results that were subject to rather small errors when several random samples taken from widely separated sections of 275-ft. rows were classified as to percentage of typical pods. In strains with 40 to 50 percent of typical pods, successive samples did not differ by more than 5 to 7 percent. Favorable results secured also with beets and carrots indicated that type studies on the quantitative basis constitute a practical method of comparing varieties.

The effect of nutrients on the water relations of tomato plants, W. B. Mack and G. J. Stout (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 536–540; abs. in Pennsylvania Sta. Bul. 320 (1935), pp. 26, 27*).—Marglobe tomato plants growing in 2-gal. crocks filled with Hagerstown clay loam and supplied with different amounts of nitrogen, phosphorus, and potassium were compared as to water requirements with other plants growing in rotted manure. A layer of crushed limestone was placed over the surface in each crock to decrease direct evaporation. Rain water was applied to all crops whenever the moisture content approached an arbitrary minimum of 10 percent for the soil and 175 percent for the manure. Records showed that growth, relative leaf area, weight of plants, moisture content, and water loss per plant were generally greater with the heavier applications of nitrogen. The number and total yield of fruits were greater with increased nitrogen, but the average weight of fruits was somewhat less in the series with weekly applications of nitrogen. Blossom-end rot was most prevalent in the higher nitrogen series and reached a maximum in the manure plats. In the one reading taken, moisture percentage of the bloom in midafternoon was lower as the applied nitrogen increased, suggesting a greater competition between leaves and other parts of the plant for water in this treatment. Flower abscission was not closely associated with nitrogen supply, and added phosphorus and potassium had no observable effect on any of the above factors.

Economical amounts of nitrate of soda to apply in the greenhouse for the growth of tomatoes, B. E. Gilbert and F. R. Pember (*Rhode Island Sta. Bul. 252 (1935), pp. 14, figs. 2*).—With Carter Early Sunrise tomatoes grown as a fall and winter crop in soils supplied with different levels of organic matter (cow manure) and with sufficient nitrate of soda applied to maintain soil nitrates at levels of 10, 20, and 40 p. p. m., the optimum plant growth and yield were secured at the lowest plant food level, namely, 7 lb. of organic matter and ⅛ lb. of nitrate of soda per 21.78 sq. ft. It is suggested that the prevailing short days and subsequent lack of carbohydrates for utilization of nitrates is a factor in the results with the fall crops.

In the case of the spring crop, plants set March 1 in the same soil without further manure applications required much larger quantities of nitrate of soda to maintain optimum growth and yields. The quantities were actually double those of the fall and winter crop, but the yields were correspondingly larger. In general conclusion the authors point out that the economical use of nitrate of soda for greenhouse tomatoes may be expected to vary with the season and with quality and amount of cow manure applied.

Influence of watering treatment on the occurrence of blossom-end rot in greenhouse tomatoes, G. J. Stout (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 515–518*).—Observations at the Ohio State University on Marhio tomato plants growing in separated parts of a greenhouse bench and watered differently with respect to time and amount showed much less blossom-end rot and many more sound fruits in those plats given heavy, infrequent waterings than in plats given light, frequent applications at different periods in their growth. The light, frequent treatments generally produced the greatest number of fruits, removing poor setting as a factor. However, in two of the light plats 75.5 and 78.9 percent of the fruits, respectively, were affected by blossom-end rot. Forced aeration of the soil had no effect on the incidence of the rot. The results on plats watered heavily at either the beginning or the end of the season indicated that proper watering is most important in the early period. Studies of the roots showed a large number of dead rootlets beneath the lightly watered plants, possibly the result of poor aeration due to the constantly wet upper surface which could have retarded gaseous exchange.

The performance of fruit tree seedlings when dug at various stages of maturity, F. E. Gardner and G. E. Yerkes (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 338–342*).—Observations at Arlington Experiment Farm, Va., on seedlings dug at weekly intervals from September 22 to November 24, 1930, indicated that digging before a certain degree of maturity is reached is decidedly harmful. In the case of mazzard cherries the September 22 lot averaged only 10.5 percent survival when lined out the next spring after being heeled in all winter in the nursery as compared with 99 percent for stock dug November 3. Notes on growth condition of the terminal buds, ease of separation of the bark, ease of stripping the leaves, and the pigmentation of the stems and leaves are given for mazzard and mahaleb cherries, Bartlett pear seedlings, *Pyrus calleryana*, French crab, and myrobalan plum. A repetition in 1931 of part of the experiment confirmed the results of the preceding season.

Root formation in softwood cuttings of apple, V. T. Stoutemyer, T. J. Maney, and B. S. Pickett (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 343–346, figs. 2*).—Tests conducted in 1931 by the Iowa Experiment Station on 660 Sharon and Missouri Flat softwood cuttings showed that not a single cutting rooted, although callusing was very abundant and many of the cuttings remained in apparently healthy condition for a long period. However, when softwood cuttings were made from shoots emanating from root cuttings about 6 in. long taken from young 4-year-old seedling apples, rooting was obtained in from 3 to 6 weeks in all cases. Damping-off in the close atmosphere of the heated frame was a factor in reducing the percentage of success. Good results were secured in another test with softwood cuttings taken from adventitious sprouts which arose from the crowns of 14-year-old seedling trees and also in the case of cuttings from sprouts of roots of Virginia crab. It is believed that rooting in these cases was due to some anatomical or biological characteristic possessed in common with juvenile seedling shoots.

A study of the root distribution of Stayman apple trees in Maryland, P. C. Marth (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 334–337*).—The separation of roots from square blocks of soil dug at various distances from the trunk in three Maryland apple orchards showed a maximum concentration of fibrous roots in the soil within 6 ft. of the trunk. However, much root development was found in the upper soil foot to a distance of 12 ft., the maximum observed. Type of soil and method of soil management were factors in root growth; for example, in the heavier soils a greater number of roots was found closer to the trunks than was the case in lighter types. Beneath sod there was a concentration of root growth in the top 6 in., whereas under cultivation there was a tendency for increased root populations in the second 6-in. layer.

Progress report of fertilizer studies with Jonathan apples upon Ephrata fine sandy loam, F. L. Overley and E. L. Overholser (*Washington Sta. Bul. 319 (1935), pp. 34*).—In this further report (E. S. R., 73, p. 180), based on 7 years' observations in an experimental Jonathan orchard in the Wenatchee district, the authors point out that trees receiving N alone or in combination with P or K, or both, made a greater average annual terminal growth, a slightly greater average diameter growth of terminals, set an increased percentage of fruit, and yielded more fruit than did the control trees or trees receiving P or K, or both. The trees receiving N alone made a slightly greater terminal growth than did those receiving N plus the other two elements. When either P or K was applied alone or combined, the resulting annual terminal growth and the diameter of the terminal growth were actually less than that of the control trees. P and K together or P alone did not give any consistent increase in trunk circumference as compared with the controls, and K alone seemed to give smaller annual increments in trunk girth than were made by the check trees. P or K applied singly or combined resulted in smaller but more highly colored apples than those on the control trees, the increased color being associated apparently with a greater sunlight intensity reaching the fruits. Summarizing results, the authors point out that under the conditions prevailing the most marked response, as indicated by annual length increment and diameter of terminal growth, percentage of spurs to blossom annually, set of fruits, and yield, were secured from the annual application of N alone.

Nitrogen intake and growth response in peach trees following fall and spring fertilizer applications, J. H. Weinberger and F. P. Cullinan (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 65–69*).—Comparisons by the U. S. Department of Agriculture of three nitrogen fertilizers (nitrate of soda, ammonium sulfate, and cyanamide) on 7-year-old Elberta peach trees near Warrenton, Va., indicated that with trees low in nitrogen the greatest response in twig growth and increased nitrogen content of the leaves may be secured with nitrate of soda applied in the spring and to a lesser degree from nitrate of soda, ammonium sulfate, and cyanamide applied in the fall, or in split applications in the fall and spring. In the second year, on the basis of growth, the three fertilizers were arranged in the descending order of nitrate of soda, ammonium sulfate, and cyanamide, with check plats last. Checking terminal growth measurements with total nitrogen content of the leaves, there was found a striking correlation of $+0.987\pm0.0055$, indicating that not only was nitrogen content of leaves an accurate measure of vigor but it was also a limiting element in growth. In the case of spring applications, relatively the same response was obtained whether cyanamide and ammonium sulfate were applied early or at the same time as the nitrate of soda.

A study of the morphological changes and the origin of roots in the tip-layered Cumberland raspberry plants, R. H. SUDDS (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 401–406, figs. 2; abs. in Pennsylvania Sta. Bul. 320 (1935), p. 26*).—In describing the morphological and anatomical changes accompanying tip layering, the author states that the increase in diameter of the rooted tip is due chiefly to an increase in the amount of secondary vascular tissue, especially xylem. Root primordia usually arose on the flanks of the three leaf traces and less frequently from branch traces and from the stele above branch gaps. All primordia arose in groups of cells which either had never ceased dividing or else were capable of resuming division under favorable conditions. At no time during the rooting or afterward was the anatomy of the cane or tip other than that of a typical stem, and the only root structures were the numerous adventitious roots and their laterals.

Further observations upon the Lloyd George red raspberry as a parent in breeding, C. D. SCHWARTZE (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 411–415*).—Observations upon additional crosses again showed (E. S. R., 71, p. 643) the value of Lloyd George as a parent in breeding new varieties of red raspberries for western Washington. Fruit shape in the raspberry did not appear to be inherited on a simple factorial basis. The Cuthbert × Lloyd George cross yielded a high percentage of conic-fruited seedlings, and this combination and Latham × Lloyd George produced the highest percentage of large-fruited seedlings. Several Lloyd George × Cuthbert seedlings approached Cuthbert in flavor. Results of artificial freezing tests indicated that Lloyd George, King, Marlboro, Antwerp, and Latham are much more winter-resistant in western Washington than is Cuthbert, and also that Lloyd George × Cuthbert seedlings are more resistant to cold than is Cuthbert. Seedling populations with a high percentage of promising seedlings contained usually the most promising seedlings.

Fertilization of red raspberries, A. E. STENE (*Amer. Soc. Hort. Sci. Proc., 31 (1934), p. 400*).—Further records (E. S. R., 72, p. 341) by the Rhode Island Experiment Station on a fertilizer experiment with the Latham raspberry again showed the value of potash, and also that moderate applications of fertilizers are more effective than large applications. Drought injury appeared to be greatest on plats where no potash was applied and next largest where no nitrogen was used.

Studies on the stomata of strawberry varieties and species, G. M. DARROW and G. W. DEWEY (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 440–447, figs. 3*).—To explain observed differences in the drought resistance of different varieties and species of *Fragaria*, studies were made by the Oregon Experiment Station and the U. S. Department of Agriculture of the stomata and their behavior. Stomata were found on the under surface of the leaf, on the petioles, and in one instance on the fruit. On the under surface stomata were confined to the vein islets. In field-grown plants Corvallis led in the number of stomata per given area of leaf surface. The range in all the varieties and species was from 200 to 500 per square millimeter. Ettersburg 121 had the largest stomata, and in general both size and shape were characteristic of the variety. The stomata of Blakemore, Corvallis, Ettersburg 121, Missionary, and *F. chiloensis* were more sunken than those of Marshall and *F. virginiana.* Soil moisture had a profound influence on stomatal movement; for example, in a severe drought in July, Corvallis, Ettersburg 121, and *F. chiloensis* stomata opened not to exceed 10 percent for an hour or two in the morning and then closed, whereas in irrigated plants the stomata remained open much longer. Overhead sprinkling on a dry day tended to increase the number of stomata to open and also the degree and duration of their opening. Under field conditions marked differences were observed in the speed of reaction of the stomata in different varieties. Under drought conditions the stomata of topped plants opened more and stayed open longer than did those of untopped plants.

The germination of strawberry seeds and the technic of handling the seedlings, E. M. Henry (*Amer. Soc. Hort. Sci. Proc., 31* (*1934*), *pp. 431–433*).—Favorable results secured by the Tennessee Experiment Station in the germination of strawberry seeds extracted directly from fresh fruits and placed in moist blotting paper at 25° C. (77° F.) indicated that strawberry seeds attain sufficient maturity for germination prior to the ripening of the flesh and that the afterripening period is very short. Varieties differed somewhat in their time of germination, and observations on the seed of known crosses indicated that the pollen parent influences the percentage of germination. Blakemore and Aroma as pollen parents gave a higher percentage of germination than did Fairfax. Tests with Missionary seeds indicated that the optimum temperature for germination is approximately 25°. Dry storage of seeds resulted in a sharp decrease of viability. An 80 percent stand of plants was secured by the expedient of transferring germinating seedlings to greenhouse flats. Field care of the seedlings is discussed.

Strawberry runner plant production in southwest Texas, E. Mortensen (*Amer. Soc. Hort. Sci. Proc., 31* (*1934*), *pp. 424–428*).—Faced by summers unfavorable to the production of runner plants, studies were conducted at Winter Haven by the Texas Experiment Station upon various methods of increasing the survival of old plants and the numbers of runners. The most prolific runner producers were Missionary, Klondike, Aroma, Thompson, and Blakemore. Of cultural treatments, clean culture with frequent irrigations during the dry periods appeared most promising. Shade crops, such as corn or weeds, were of dubious value due to their use of water and food. Mulching with straw proved effective in increasing survival and the number of runners by interfering with the rooting of the young runners.

Conditions affecting cold resistance in strawberries, T. A. Steele, G. F. Waldo, and W. S. Brown (*Amer. Soc. Hort. Sci. Proc., 31* (*1934*), *pp. 434–439, fig. 1*).—Observations by the Oregon Experiment Station and the U. S. Department of Agriculture on strawberry plants grown in coldframes exposed to ordinary climatic conditions and in pots in the greenhouse, the temperature of which ranged from 65° to 85° F., and later exposed to different freezing temperatures in controlled chambers showed marked varietal differences in cold resistance. An exposure of 24 hr. at 0° killed all plants of all varieties on three dates, October 10, November 1, and December 5. At 10° all plants were killed October 10 and November 1, but on December 5 injury ranged from all dead in Wickson to all alive in Redheart and Narcissa. Freezing at 18° caused some injury on October 10, November 1, and December 5. At 10° all plants were killed October tions on bloom the succeeding spring indicated that blooming was actually stimulated in certain varieties by exposure to 18° and 27°. Following 24 hr. at 18° the subsequent yields of greenhouse-grown Corvallis and Narcissa plants were reduced 71 and 95 percent, respectively, as compared with 35 and 44 percent for coldframe plants. All plants of both varieties were killed by 24 hours' exposure to 9°. Potted plants saturated with water for 2 weeks prior to freezing at 6°, 18°, and 22° for 24 hr. suffered more than comparable plants watered moderately or kept dry. Sudden dropping of temperature was found more injurious than a gradual decline, and vigorous, well-rooted plants which had never fruited were injured less than those which had fruited or young runners which were not well rooted.

Relation of temperature of fruit to firmness in strawberries, D. H. Rose, M. H. Haller, and P. L. Harding (*Amer. Soc. Hort. Sci. Proc., 31* (*1934*), *pp.*

429, 430, fig. 1).—As observed by the U. S. Department of Agriculture in pressure determinations on strawberries stored at various temperatures from 32° to 70° F., there was in all cases a consistent increase in firmness correlated with a decrease in temperature. Similar experiments with a squeeze testing apparatus showed a slight although significant increase in firmness with the lowering of temperature. The authors suggest that cooling increases the resistance of the epidermis but has little influence on the crushing of the berries.

A study of production and physiology of Concord grape vines as affected by variations in the severity of pruning, T. J. Maney and H. H. Plagge (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 392–396*).—Using vigorous 6-year-old vines trained to the single stem two-wire Kniffen system, it was found at the Iowa Experiment Station that in deep, fertile soil such as characterized the experiment long canes with from 25 to 30 buds each were more productive than shorter canes; in fact, these long canes yielded approximately three times the fruit of any other treatment. With canes of 8 to 10 buds the peak of production was generally between the fourth and seventh nodes. On the 25- to 30-bud canes production was fairly well distributed from the seventh to the most distant bud. The performance of buds nearest the main stem was found related to the length and number of buds on the cane; for example, in the case of vines with 20 two-bud spurs total production was highest for all the 40-bud treatments. Weight of prunings varied not more than 2 lb. between the extremes. Chemical examinations of the dormant buds and wood showed such slight differences that no correlation could be established between composition and fruitfulness except in the roots. There was a build-up in the off year and a depletion in the on year of reducing sugars and colloidal and noncolloidal nitrogen.

Physiological studies of uneven ripening of Concord grapes, F. B. Cross and J. E. Webster (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 361–364*).—Of various treatments tested by the Oklahoma Experiment Station as means of influencing the coloring of Concord grapes, the manipulation of environmental factors which tended to extend, protect, or conserve the leaf area per cluster of fruit was most effective. The highest average percentage of purple berries (81.7) was secured when only one cluster was left per cane and the cane itself was not tipped. Treatments which reduced foliage below normal tended to reduce the percentage of purple berries, the minimum (34.9) being reached where two clusters per cane had only five leaves. Since sugar synthesis takes place in the leaves and since analyses showed the direct relationship between the amount of sugar in the berries and their coloring, the authors conjecture that more extensive leaf area is effective in reducing uneven ripening through its greater sugar production.

Chemical and enzymatic studies of the uneven ripening of Concord grapes, J. E. Webster, E. Anderson, and F. Cross (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 365–369*).—Analyses by the Oklahoma Experiment Station of fully colored, partly colored, and green berries taken from the same grape cluster showed marked differences in sugar contents and suggested that under Oklahoma conditions Concord grapes do not color properly unless at least 7 percent of total sugars are present. A preponderance of levulose was found in the green and partly colored berries, whereas in fully ripe berries the levulose and dextrose were nearly equal. Tartaric acid and astringency readings did not show any unusual trends that might relate to coloring. Catalase activity was definitely much higher in the neutralized juice of colored berries, but other enzymes showed no marked differences. Thus the chief difference between the juice of purple and green berries lay in the much lower sugar content of the latter.

Breeding for seedless vinifera grapes, E. Snyder (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 381–383*).—Data presented on the results of crosses between

Muscat of Alexandria, Muscat Hamburg, and Monukka as maternal parents and various seedless varieties, such as Corinthe Blanc, Corinthe Rose, and Sultanina, as pollen parents, showed that in the 85 percent of seedlings which fruited 13.2 percent had reflexed stamens, although both parents had upright stamens. With respect to color, white functioned as a pure recessive, whereas in most cases black was heterozygous. A total of 29 seedless or practically seedless grapes were produced, representing 12.4 percent of the total fruiting plants. No seedless plants were secured from crosses of the true seedless current types, namely, Corinthe Blanc, Corinthe Rose, and Panariti. Muscat Hamburg apparently transmitted the factor for Muscat flavor more freely than did Muscat of Alexandria.

Vinifera grape cion influence on Dog Ridge stock, E. Snyder and F. N. Harmon (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 374, 375*).—Observations at Fresno, Calif., by the U. S. Department of Agriculture on 116 29-year-old vinifera grapevines of several varieties, grafted on Dog Ridge roots and in excellent condition at the time of measurement, showed the average stock size to be 73.3 percent that of the scion, denoting a general scion overgrowth. The correlation between size of stock and that of the scion as judged by cross sections above and below the union was 0.59±0.04, indicating that the scion had exerted a marked influence on rootstock development.

Empty-seededness in varieties of Vitis vinifera, H. P. Olmo (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 376–380, fig. 1*).—Marked differences observed by the California Experiment Station at Davis in the germination of seeds of different vinifera grape varieties were found associated with the number of empty mature seeds. When varieties were arranged in order of increasing viability it was noted that those with a high proportion of empty seeds were also of low viability. A tabulation of records taken by the author, F. T. Bioletti, and H. Pearson indicated that varieties differ in their percentage of empty seeds from season to season, due apparently to environment, size of preceding crop, or other factors not genetic. Hybrids between vinifera and other species for the most part produced seeds of high viability. The author suggests that the hereditary factor or factors that determine empty seeds are apparently of a recessive nature. The structure of abnormal seeds is discussed. No evidence was found that the pollen parent influences the percentage of empty seeds, indicating that the cause is maternal and exterior to the developing zygotes.

Grape root distribution studies, F. N. Harmon and E. Snyder (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 370–373, fig. 1*).—A study by the U. S. Department of Agriculture at Fresno, Calif., of the distribution and concentration of the roots of 32 irrigated vinifera grapevines grafted on phylloxera-resistant roots showed rather clear-cut differences associated with rootstocks; for example, irrespective of the scion variety, the Australis, Salt Creek, and Riparia Grand Glabre were relatively shallow rooted, with most of their roots in the upper 2 ft. of soil. It was evident that the tendency toward deep or shallow rooting was determined largely by the rootstock. In general, within a given rootstock, the weight of roots was greatest with the more vigorous top growth. Under the conditions, plants 8 by 8 ft. and 25 yr. old, there was intermingling of roots, foreign roots making up 36.7 percent of all recovered. One main root was followed 19 ft. without reaching its terminus.

The response of the Hunisa grape to girdling, H. E. Jacob (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 386–388*).—In this study by the California Experiment Station at Davis canes of Hunisa, a vinifera grape producing both seeded and seedless berries on the same cluster, were girdled (1) about 4 weeks before full bloom, (2) when from 10 to 40 percent of the flowers were open, and (3) after bloom was past and the berries had set. Girdling, regardless of the time performed, did not increase the number of seeded berries per cluster but did increase markedly the number of seedless berries. The effect was greatest in the case of girdling when the vines were approaching full bloom; in fact, girdling after the berries had set did not increase the number of seedless berries appreciably, if at all, but did increase their size very materially. No hastening of maturity followed girdling.

The edible passion fruit in Hawaii, W. T. Pope (*Hawaii Sta. Bul. 74* (*1935*), *pp. 22, figs. 7*).—General information is presented on botanical characteristics, pollination, composition of the fruit (including analyses), general cultural requirements, and varieties.

The effect of storage temperatures on flowering of greenhouse hydrangeas (Hydrangea macrophylla), R. C. Allen (*Amer. Soc. Hort. Sci. Proc., 31* (*1934*), *p. 638*).—Observations at Cornell University on the subsequent blooming of hydrangea plants stored prior to forcing at temperatures of 33° and 50° F. showed that a preforcing treatment of 33° for from 4 to 6 weeks reduced considerably the time required to bring the plants into bloom.

Dormant rose plants as affected by temperature and moisture while in storage, G. E. Yerkes and F. E. Gardner (*Amer. Soc. Hort. Sci. Proc., 31* (*1934*), *pp. 347–350, fig. 1*).—Observations by the U. S. Department of Agriculture on rose plants of several varieties packed in lined boxes filled with granulated peat or shingletow wetted to contain 40, 48, 58, and 65 percent by weight of moisture and held for 60 days at three temperatures (48° F. variable and 40° and 50° constant) showed a progressive increase in growth correlated with the water content of the packing. This correlation was found at all temperatures above freezing. The moisture content of the rose plants at the time of packing was approximately 48 percent. Other experiments with plants packed tightly in boxes held at constant temperatures of 30°, 32°, 36°, and 40° showed that boxed roses keep in the best condition at 30°. Packing material with 36 and 40 percent of water maintained plants in common storage in better condition than did higher moisture contents. The damage from decay varied more with maturity condition and the variety than with the water content at time of packing.

The reaction of certain ornamental trees and shrubs to liming, T. E. Odland, H. F. A. North, and G. B. Durham (*Rhode Island Sta. Bul. 250* (*1935*), *pp. 24, figs. 4*).—The results are presented, largely in tabular form, of investigations regarding the response of 85 species and varieties of ornamental trees and shrubs to lime and also to sulfate of ammonia and nitrate of soda. Among plants showing a marked favorable response to lime were *Myricaria germanica, Lonicera tatarica, Deutzia lemoinei, Hydrangea arborescens,* and *Cercis canadensis.* Among those to which lime was distinctly harmful were *Sorbus americana, Celastrus scandens, Rubus odoratus, Pachysandra terminalis,* and *Clethra alnifolia.* A large percentage of the species showed no marked response in either direction.

An examination of the soil following the experiment showed that wintercreeper, *Deutzia,* heather, juniper, mugho pine, and mountain-ash had a particular tendency to increase the acidity of the soil.

With reference to the sources of nitrogen, a few species appeared to thrive better with either sulfate of ammonia or nitrate of soda regardless of the soil reaction. Brief tabulated descriptive notes are presented for the various plants.

The fertilization of shade trees in the nursery, L. C. Chadwick (*Amer. Soc. Hort. Sci. Proc., 31* (*1934*), *pp. 357–360*).—Repeated measurements taken by Ohio State University on Moline elm trees fertilized at different seasons with different materials, including an inorganic 12-6-4, an organic 6-6-4, ammonium sulfate, and a mixture of ammonium sulfate and superphosphate, although showing some discrepancies due apparently to drought suggested that the complete mixture high in nitrogen and the mixture of ammonium sulfate and superphosphate were most beneficial. An explanation of the superiority of ammonium sulfate plus superphosphate over ammonium sulfate alone is suggested in the possible benefit of phosphorus on nitrogen absorption or on root growth. Furthermore, ammonium sulfate alone may have injured roots, but such condition was not indicated in the foliage.

FORESTRY

[Forestry at the Mountain Substation] (*Georgia Sta. Rpt. 1935, pp. 44-47*).—Results are noted from studies conducted in cooperation with the Appalachian Forest Experiment Station on the growth rate of mountain farm woodlands, methods of improving existing stands, planting, and methods of securing natural reproduction after cuttings.

Transplanting oak seedlings, W. E. WHITE (*Pennsylvania Sta. Bul. 320 (1935), p. 24*).—A brief statement is presented regarding the effect of injury to the tip of the sprout of red oak seedlings on their subsequent root and top development.

DISEASES OF PLANTS

Report of the nineteenth annual meeting of the Pacific division of The American Phytopathological Society (*Phytopathology, 25 (1935), No. 9, pp. 890-898*).—Abstracts of the following papers presented at this meeting are included: California Celery Mosaic Diseases, by H. H. P. Severin and J. H. Freitag (p. 891): A New Blight of Pea in California [due to an apparently undescribed fungus], by W. C. Snyder (pp. 891, 892); An Experiment to Determine the Susceptibility of Flax to Verticilliosis, by B. A. Rudolph (p. 892); To Visualize a Distinction between Viruses and Organisms, by J. L. Hewitt (p. 892); Aeroplane Dusting with Sulphur to Combat Stem Rust of Wheat, by W. W. Mackie (pp. 892, 893); An Unidentified Species of *Sphaeropsis* on Maize in California, by W. W. Mackie, H. Johann, and N. E. Stevens (p. 893); Observations on a Species of *Ligniera*, a Root Parasite of *Stellaria media* [probably *L. junci*], by J. T. Barrett and H. Parker (p. 893); A *Phytophthora* Root Rot of Cauliflower [due to *P. megasperma*], by C. M. Tompkins, C. M. Tucker, and M. W. Gardner (pp. 893, 894); Crown Gall on Conifers, by C. O. Smith (p. 894); An Outbreak of Curly Top on Pansy, by B. F. Dana and F. P. McWhorter (p. 894); Root Rot of Aster Caused by *Phytophthora crytogea*, by C. M. Tompkins, C. M. Tucker, and A. E. Clarke (p. 895); Observations on the Pathological Histology and Phyto-chemistry of [the potato] Psyllid Yellows, by J. R. Eyer (p. 895); Toxicity of Compounds of Ammonia to *Sclerotium rolfsii*, by A. E. Davey and L. D. Leach (pp. 895, 896); Soil Amendments for Southern *Sclerotium* Rot of Sugar Beets [due to *S. rolfsii*], by L. D. Leach and A. E. Davey (p. 896); The Relation of *Penicillium vermoeseni* to a Disease of Ornamental Palms, by D. E. Bliss (p. 896); The Symptoms of Narcissus Mosaic Developed within the Plant, by F. P. McWhorter (pp. 896, 897); A Peach Tree Disease Recently Discovered in California [of undetermined nature], by H. S. Reed and H. H. Thornberry (p. 897); Endoxerosis of Lemon Fruits as Affected by the Application of Different Amounts of Irrigation Water, by E. T. Bartholomew (p. 897); The Interpretation of Oregon Tip Blight [of tomatoes] on a Basis of Causal Viruses, by F. P. McWhorter and J. A. Milbrath (pp. 897, 898); The Properties and Interpretation of Tulip-Breaking Viruses, by

F. P. McWhorter (p. 898); and An Explanation of *Rhizomyxa hypogaea* Borzi [suggesting that Borzi's *Rhizomyxa* may have been an association of *Ligniera* and an undescribed species of the order Ancylistales], by J. T. Barrett (p. 898).

The Plant Disease Reporter, October 15 and November 1, 1935 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 19 (1935), Nos. 17, pp. 270–284, fig. 1; 18, pp. 285–293, figs. 2*).—Among other items of interest, data are given on the following subjects:

No. 17.—Current information on the Dutch elm disease (see p. 362); herbaceous ornamentals heavily infested by *Heterodera marioni* (a list with localities), by G. H. Godfrey; some notes on fungi causing diseases of cabbages and other crucifers, by C. Chupp and P. P. Pirone; diseases of vegetable crops in Georgia (an annotated list under 16 crop plants and including detailed percentage losses in 13 varieties of onion, 3 of leek, and 1 of garlic from *Bacillus carotovorus* soft rot, and in garden peas from joint injuries by *Bacterium pisi* wilt, *Mycosphaerella pinodes* foot rot, and *Ascochyta pisi* leaf spot), by J. H. Miller; occurrence of tobacco blackshank in Tennessee (apparently the first authentic report for the State), by P. R. Miller; and diseases of nut crops in the Pacific Northwest in 1935 (including 10 diseases and injuries of walnuts and filberts), by P. W. Miller.

No. 18.—Bacterial wilt of corn in Nassau County, Long Island, New York, in 1935 (including the results of tests with wilt-resistant hybrids), by M. C. Richards; incidence of bacterial wilt of corn in the eastern United States in 1935 (including 9 States, with the general report that wilt was of commercial importance on susceptible varieties in and south of southern Pennsylvania and central New Jersey and locally on Long Island, and with a discussion of experimental forecasts), by N. E. Stevens; occurrence of wheat mosaic in Indiana and Illinois in 1935 (including first reports for 6 counties and data on varietal resistance and susceptibility), by H. H. McKinney; late blight of potatoes in New York State in 1935 (including 2 maps), by C. Chupp; curly top in Idaho in 1935, and pea diseases in Idaho in 1935 (including data on mosaics and the report that tests with other legumes have indicated alfalfa and sweetclover to be unimportant in the overwintering of the type of pea mosaic common in Idaho), both by C. W. Hungerford and W. H. Pierce; stem gall on snowball (*Viburnum opulus*) (hitherto unreported from the District of Columbia and shown to be due to *Phomopsis* sp.), by N. A. Brown; and a progress report on Dutch elm disease eradication in the eastern United States.

[Plant disease studies in Georgia] (*Georgia Sta. Rpt. 1935, pp. 21, 22, 35, 36*).—Progress reports are given on peach winter injury and its alleviation by the use of nitrogenous fertilizers, breeding peanuts for disease resistance, tomato wilt, and fire blight of pear trees (including data on the relative susceptibility and resistance of different varieties and seedlings tested on the station grounds.

[Plant disease studies at the Pennsylvania station] (*Pennsylvania Sta. Bul. 320 (1935), pp. 18–20, fig. 1*).—Progress reports are given on the following studies: A blight-resistant pear, by E. L. Nixon; mushroom diseases (the pH range of several fungus diseases of mushrooms showing their prevalence to be associated with unsatisfactory conditions of the compost), by W. S. Beach; disease-resistant potatoes (with several promising seedlings developed from various cross- and self-pollinations), by Nixon; and tobacco wildfire (including the successful use of bordeaux mixture, copper-lime dust, and calomel for control), by Beach.

The pathogenicity and genetics of Gibberella saubinetii (Mont.) Sacc., C. J. Eide (*Minnesota Sta. Tech. Bul. 106 (1935), pp. 67, pls. 7, figs. 9*).—The complexity and variability of the genus *Fusarium* presents a perplexing problem which it was believed might be further elucidated by the study of a species normally producing a perfect stage. Accordingly, *G. saubinetii*, a common pathogen on cereals and corn in the United States, was selected for studies, the main results of which were as follows:

Of 325 single-ascospore isolates from spontaneously occurring material, all but 31 were of the same cultural type. Of the 31, 24 were like the majority on potato-dextrose agar but differed on Coons' agar. The remaining 7 comprised 3 types, 2 represented by 1 culture each and the third by 5 cultures from a single collection.

Variants of *G. saubinetii* were common on Coon's agar but less frequent on potato-dextrose agar, and most of them fell into a relatively few cultural groups. Fresh isolates, with one exception, failed to produce perithecia in culture, but in the absence of visible variation most of them did so in the greenhouse under approximately field conditions. The variants apparently lost their power to form perithecia under these conditions. Negative results followed all attempts to induce perithecial formation by growth on different media, by subjection to different temperatures, and by exposure to ultraviolet light. As with other cultural variations, the ability to form perithecia sometimes appeared spontaneously, and 5 such variants were isolated. Perithecial variants retained their cultural characteristics and ability to form perithecia when propagated from single ascospores or conidia, or from germ tubes of individual cells of either spore type, thus showing the homothallic nature of the cultures studied. Three cultures forming rudimentary perithecia were never observed to produce ascospores.

In common with most ascomycetes the ascospores were formed from a single nucleus, but consisted of 4 cells when mature. Though a few cells contained 2 nuclei, each cell usually contained but 1. The conidial cells were also predominantly uninucleate.

Field studies having indicated that there are differences in pathogenicity among strains of *G. saubinetii*, as well as differences in susceptibility among the host varieties, a method was developed for determining the relative pathogenicity of the fungus on corn and wheat seedlings by which it became possible to detect even very small differences in virulence. In the absence of variation ascospore isolates from field material differed but little in pathogenicity, but cultural variants might differ decidedly, some of them being less virulent than the parent cultures.

Pestalotia spp. on Aucuba, Cibotium, and Leucothoë, R. P. White (*Mycologia, 27 (1935), No. 4, pp. 342–346, pl. 1*).—During studies at the New Jersey Experiment Stations relative to the pathogenicity of various species of *Pestalotia*, the following new species were encountered and are here described: *P. aucubae* on leaves of *A. japonica variegata* following infections by *Colletotrichum pollaccii*, *P. leucothoës* on leaves of *L. catesbaei* following other infections and winter injury, and *P. cibotii* parasitizing living fronds of *Cibotium schiedei* in the greenhouse.

The Dilophospora disease of cereals and grasses [trans. title], D. Stieltjes (*Tijdschr. Plantenziekten, 39 (1933), No. 8, pp. 200–206, pls. 3; abs. in Rev. Appl. Mycol., 13 (1934), No. 1, pp. 20, 21*).—Seeds of oats, wheat, rye, and some 20 species of grasses were sown in affected soil, mixed with a few oat seeds infected by *D. graminis*. The resulting oat seedlings became infected in varying amounts, as did also *Avena elatior*, *Holcus lanatus*, and *Agrostis spica venti*. However, rye was only slightly attacked, and wheat not at all. In none of the infected plants could the slightest trace of the eelworm *Tylenchus tritici* be found. The symptoms of the disease, here described, were similar in oats and in the susceptible grasses noted, but in rye the ears usually developed normally, though the plants were shorter due to stunting of the upper node. The existence of biological strains of the fungus is postulated from the resistance of wheat and various grass species to the local strain of the fungus used.

Absorption of sulphur dioxide by alfalfa and its relation to leaf injury, M. D. THOMAS and G. R. HILL, JR. (*Plant Physiol., 10 (1935), No. 2, pp. 291–307, figs. 5*).—A considerable number of fumigation experiments (1927–31) were conducted to determine the rate of absorption of sulfur dioxide by alfalfa leaf tissues and the relation of the amount absorbed to the leaf destruction, most of the data being obtained by the method of continuous air analysis.

The extent of leaf destruction proved to be a linear function of the amount of sulfur dioxide absorbed in a given time. An appreciable amount of gas was absorbed without leaf destruction, and the amount of destruction following a given amount of absorption increased with the rate of absorption. For a definite amount of destruction at relatively high exposures, the amount of absorption was a linear function of the time required for the absorption.

It is shown that if an absorption factor, *A*, which depends on the activity of the leaf in taking up the gas, is constant in a series of tests, the absorption equation can be transformed readily into time-concentration exposure equations. In this way the fumigation data of P. J. O'Gara (1922) and the absorption data here reported lead to practically identical equations for the exposure conditions inducing incipient marking in alfalfa under maximum sensitivity relations. It is also possible to calculate from the absorption equations the exposure condition for any specified amount of leaf destruction or value of *A*.

The data indicate that when the absorption rate exceeds a certain threshold value a specified amount of injury appears in a time proportional to the difference between the actual and the threshold rates of absorption. The leaf cells can dispose of a certain amount of the gas by oxidation and neutralization, but injury follows if the gas supply is too rapid for the maintenance of these processes. Assuming that the lethal dosage is added instantaneously and that it is all absorbed by the mesophyll cells, it is suggested that the limit of tolerance of these cells to the gas is approximately 2,700 p. p. m. in dry and 540 p. p. m. in fresh tissues.

Effect of fertilizers on the yield of cotton and on the control of the root-rot disease of cotton on the Blackland Prairie soils of Texas, E. B. REYNOLDS and H. E. REA (*Jour. Amer. Soc. Agron., 26 (1934), No. 4, pp. 313–318*).—In 85 cooperative experiments between the Texas Experiment Station and farmers in the Blackland Prairie section of Texas (1930, 1931, and 1932), the 4–8–4, 4–8–0, and 6–12–0 fertilizers produced significant increases in yield but had no effect on the root-rot disease.—(*Courtesy Biol. Abs.*)

Bacterial diseases of plants occurring in Formosa.—IV, Bacterial brown-stripe of Italian millet, N. OKABE (*Jour. Soc. Trop. Agr. (Nettai Nôgaku Kwaishi), 6 (1934), No. 1, pp. 54–63, figs. 3*).—Continuing this series of studies (E. S. R., 70, p. 344), a new bacterial disease of Italian millet (*Chaetochloa italica*) is reported, including data on the morphology, physiology, and taxonomy of the causal organism, *Bacterium setariae* n. sp., and on the results of successful inoculation tests. The disease is characterized by the presence of long, narrow, deep brown or clove brown longitudinal streaks, variable in length, but from 0.2 to 0.7 mm in width almost uniformly throughout the whole length. This organism differs in various characters from *B. albopreciptans* (on *Chaetochloa* spp.) and from the other 18 species known to infect the Gramineae.—(*Courtesy Biol. Abs.*)

Onion rusts of Japan.—II, Biometrical studies on uredio- and teliospores, K. GOTO (*Jour. Soc. Trop. Agr. (Nettai Nôgaku Kwaishi), 6 (1934), No. 1, pp. 44–

53, fig. 1).—Continuing this series (E. S. R., 71, p. 206), the author endeavored to determine whether biometrical differences exist in the spores of northern v. southern strains of rusts attacking species of *Allium* and of the same strain on different hosts. Since the stage of maturity of the urediospores considerably influences their size all measurements were made on new crops after all old spores had been removed, 50 spores from each of 4 subpreparations being used for each determination. The teliospores were obtained from the center of each telium in herbarium material, 25 spores from each of 16 subpreparations being used for each determination.

As regards the urediospores, there were, in general, no marked differences biometrically recognizable between the northern and southern strains or among the 8 hosts used, except for the culture on *A. cepa* (onion). On the other hand, measurements of the teliospores indicated that environmental conditions induce statistically significant differences in relation to both size and shape. Teliospores of the same strain cultured at Taihoku (southern locality) became broader than those cultured at Morioka (northern locality). The length of the teliospores of a strain differed on different hosts, but there was no marked distinction in shape. The teliospores of 3 northern strains compared among themselves showed some differences in linear dimensions, but no significant differences in shape. However, when compared with a southern strain significant differences were recognizable in both linear dimensions and shape.

Yellow dwarf, a virus disease of onions, and its control, W. J. HENDERSON (*Iowa Sta. Res. Bul. 188* (*1935*), *pp. 209–255, figs. 20*).—This disease was discovered in Iowa in 1927, and the increasing damage to the onion crop led the author to initiate in 1928 an intensive study.

This mosaic virus overwinters in infected onion bulbs and in volunteer plants in the field, but it is probably neither seed borne nor soil borne. The symptoms induced are detailed.

Plants grown from infected onion sets and those becoming infected early in the growing season produce underdeveloped bulbs, but plants with masked infection throughout the growth period produce apparently normal plants and yields.

The disease is transmissible by artificial inoculation and by insect vectors, the incubation period in the former case usually being about 10 days. The virus from infected onion leaves that mask the symptoms is infective. The demonstrated insect vectors are the corn leaf aphid (*Aphis maidis*), the bean aphid (*A. rumicis*), and the apple grain aphid (*Rhopalosiphum prunifoliae*).

The virus was inactivated when the viriferous juice was stored in vitro at 29° C. for 112 hr. After storage of infected onion leaves in the open at 29° for 100 hr., their extracted juice proved noninfective. On 10-min. exposures the infectivity was only slightly retarded at 70°, it was reduced by 55 percent at 75°, and at 80° the virus was inactivated. However, exposures for 6 hr. to temperatures as low as —14° failed to inactivate it. Inoculations with dilutions at or above 1:10,240 failed to induce infection.

Successful inoculations with the virus were obtained in the Chinese sacred lily (*Narcissus tazetta*), jonquil (*N. jonquilla*), and shallot (*Allium ascalonicum*). Inoculations with other plant viruses, including mosaic of the Chinese sacred lily and jonquil, failed to infect onion plants. The extracted juices of 15 weeds growing near infected onion fields failed to cause yellow dwarf in onions.

Of 36 onion varieties tested, only Riverside Sweet Spanish appeared to possess marked resistance.

Effective control was obtained by the combined effect of indexing all growing stocks of bulbs, producing the planting stocks of bulbs in areas free from the disease, and roguing out of infected volunteers in the fields.

Downy mildew of peas caused by Peronospora pisi [DeB.] Syd., L. CAMPBELL (*Washington Sta. Bul. 318 (1935), pp. 42, figs. 8*).—Downy mildew of peas was first recorded for the State of Washington in 1922, and recently it has assumed considerable economic importance in the Pacific Coast States. Of 19 varieties of peas observed in the field, all were susceptible to *P. pisi*. Of 17 varieties (garden, canning, and field peas) inoculated in the greenhouse, all showed essentially the same degree of susceptibility.

Vicia gigantea was the only other legume found infected with a *Peronospora*, but it proved distinct from the pea form and is described as *P. vicicola* n. sp. Both these fungi, inoculated in the greenhouse into peas, alfalfa, red clover, white clover, sweet pea, chickpea, broadbean, lentil, and 8 species of vetch, proved to be restricted in parasitism to the host species of origin.

The description of *P. pisi* is emended to include the oospores. The conidia produce germ tubes which enter the host through the stomata, and the mycelium ramifies through the intercellular spaces and forms intracellular haustoria. After from 6 to 9 days' incubation the conidiophores emerge from the stomata, but oospore production has been observed as early as 5 days after inoculation. The mycelium is usually found in the seeds of infected pods, while the oospores crowd the infected pod tissues and often occur on the surface of the proliferated endocarp. Though usually local, infection is sometimes systemic, and in the latter case the oospores may occur in any parenchymatous tissue of the aerial parts. The symptomatic details of the disease are given.

Field indications that the soil is a source of primary infection were confirmed by greenhouse tests. Seeds contaminated with oospores or with mycelium in the seed coat failed to produce infected plants in greenhouse tests, though field observations suggested seed transmission.

Moist, cool weather is conducive to the development of the disease, but dry weather prevents or greatly retards it. Greenhouse tests apparently indicated that if free water is retained on inoculated plants for 4 hr. infection results, but if kept wet for only 2 hr. no infection follows. In the greenhouse the fungus developed well at from 32° to 70° F., but a temperature of 80° proved unfavorable to it. Desiccation for 15 min. was fatal to the conidia.

In greenhouse tests, where the time of inoculation could be controlled, a 3-5-50 bordeaux-Penetrol mixture gave good control against conidial infection when the fungicide was applied before inoculation. A large number of commonly used spreaders were employed with various fungicides, but the only effective spreader was Penetrol. However, when pea plants were drenched with sprays containing it or when it was used in excess some leaf burning resulted.

Neither hot-water not hot-air seed treatments gave conclusive results as to their value in preventing seed transmission in the field. The hot-water treatment, as used, and hot-air treatment more severe than 70° C. for 9 hr. either prevented or materially reduced seed germination.

Rotation of crops is recommended under conditions conducive to the development of downy mildew, and the use of seed from arid sections is considered expedient.

Alternaria dry rot of potato tubers [trans. title], **J. GOOSSENS** (*Tijdschr. Plantenziekten, 39 (1933), No. 7, pp. 165–172, pls. 2; abs. in Rev. Appl. Mycol., 13 (1934), No. 1, p. 54*).—The author reports damage in the Netherlands (up to 25 percent of the crop in 1932–33) to potato tubers of the varieties Bintjes, Eerstelingen, and Eigenheimer, due to *A. solani*. The tuber symptoms are described, the life history of the fungus and factors affecting its incidence are discussed, and control measures are suggested. Spore inoculations generally gave negative results, but mycelium from cultures inoculated into wounds induced uniformly successful infections.

Insect transmission, host range, and field spread of potato calico, D. R. Porter (*Hilgardia* [*California Sta.*], *9* (*1935*), *No. 8, pp. 383–394, figs. 9*).—Continuing these studies (E. S. R., 66, p. 443; 68, p. 325), potato calico was transmitted from infected to healthy White Rose and seedling potato plants by originally nonviruliferous aphids (*Macrosiphum solanifolii*). The following were also proved susceptible: *Lycopersicum esculentum, Capsicum annuum, Solanum melongena, Datura stramonium*, and *Petunia* sp. Calico was experimentally transmitted to the potato varieties White Rose, White Ohio, Katahdin, Chas. Downing, Rural New Yorker No. 2, Early Rose, Jersey Red Skin, Green Mountain, Irish Cobbler, Earliest of All, and Russet Burbank (Netted Gem), and it has also been found on Bliss Triumph, Garnet Chili, and Idaho Rural.

Natural spread in the field occurred at Santa Clara, Stockton, and Davis, Calif. Late planting in the Sacramento Valley decreased the actual spread from 55 to 7 percent as compared with early planted stock in the San Joaquin Valley.

A comparison of Leptosphaeria salvinii and Helminthosporium sigmoideum irregulare, E. M. Cralley and E. C. Tullis (*Jour. Agr. Res.* [*U. S.*], *51* (*1935*), *No. 4, pp. 341–348, figs. 4*).—In this cooperative study between the Arkansas Experiment Station and the U. S. D. A. Bureau of Plant Industry, a disease of rice with symptoms and seasonal development resembling those of stem rot (due to *L. salvinii*) (E. S. R., 70, p. 796) was observed in Arkansas, Louisiana, and Texas. The fungus shown to cause the disease had a conidial stage similar to *H. sigmoideum*, the conidial stage of *L. salvinii*, but a sclerotial stage distinctly different from *Sclerotium oryzae*, the sclerotial stage of *L. salvinii*. As no perithecial stage was observed for the fungus it was named *H. sigmoideum irregulare* (E. S. R., 72, p. 787), and is here more adequately described and compared morphologically with the corresponding stages of *L. salvinii* as previously described.

Ontogeny of the phloem in sugar beets affected by the curly-top disease, K. Esau (*Amer. Jour. Bot.*, *22* (*1935*), *No. 2, pp. 149–163, figs. 13*).—Continuing this series of studies (E. S. R., 71, p. 658; 72, pp. 353, 594, 633), the author found that the degeneration induced in the phloem by the curly top virus follows a definite course, to the consecutive stages of which descriptive terms may be applied. In young leaves of infected plants degeneration becomes clearly evident after one or more primary sieve tubes have developed. Parenchyma cells adjacent to these sieve tubes undergo hypertrophy (primary hypertrophy) and die (primary necrosis). Cells further removed from the sieve tubes are stimulated to growth and division (primary hyperplasia) and give rise to a tissue in which sieve-tube-like cells predominate. This hyperplastic tissue later dies and collapses (secondary necrosis). Parenchyma cells near lesions undergo secondary hypertrophy and hyperplasia, resulting in proliferations resembling wound-healing tissue.

The study strongly suggests that the agent inducing phloem degeneration enters this tissue through the first-formed sieve tubes.—(*Courtesy Biol. Abs.*)

Initial localization and subsequent spread of curly-top symptoms in the sugar beet, K. Esau (*Hilgardia* [*California Sta.*], *9* (*1935*), *No. 8, pp. 397–436, pls. 4, figs. 7*).—Continuing these studies (see above), a close connection was found to exist among the vascular traces of different leaves and between the leaf traces and vascular rings in the roots of young beet plants.

The external symptoms of curly top develop only in young leaves, and they appear first in those most closely connected by phloem to the inoculated leaf. The first internal symptoms also are strictly localized and develop in the regions directly connected to the inoculated leaf. Phloem degeneration may start in traces containing no mature xylem, and in the primary root it appears before the protoxylem is differentiated. In the fleshy taproot phloem degeneration appears first on the side from which the inoculated leaf diverges, but later it spreads laterally in the older and from them to the newly developing rings. Phloem degeneration in the roots (as in the leaves) starts near the first sieve tubes and spreads thence to cells farther away.

Bodies believed to be intracellular inclusions usually occur adjacent to the first sieve tubes, from which the injurious agent appears to spread in the phloem and less frequently in cells farther away. If the cells containing the inclusions do not become necrotic, these bodies disintegrate. Cells degenerating most severely undergo necrosis very early in their development, and less deeply affected cells usually develop into sieve-tube-like elements.

These observations on the localization and spread of the symptoms in curly top of beets are believed to support the theory that the virus is translocated in the phloem tissue and, particularly, in the mature sieve tubes.

Gum-producing organisms in sugar cane, M. T. Cook and P. M. Otero (*Jour. Dept. Agr. Puerto Rico, 17 (1933), No. 4, pp. 271–286, pls. 2*).—A brief history is given of the gummosis disease of sugarcane, with special attention to the morphological strains of *B[acterium] vascularum* (together with the results of inoculation studies of sugarcane during 1932 and 1933), as showing that these strains had great variations in color and virulence. Finally, the results of fermentation studies with different sugars and of serological tests are reported.—(*Courtesy Biol. Abs.*)

The pineapple disease of sugar cane in Puerto Rico, M. T. Cook (*Jour. Dept. Agr. Puerto Rico, 17 (1933), No. 4, pp. 305–309*).—This paper briefly reviews the present knowledge on *Thielaviopsis paradoxa* and the results of 3 yr. of experimental work on the disease induced by it. Fifteen varieties of sugarcane were tested in the field for susceptibility and resistance to this fungus, Co.–281 proving the most resistant. The virulence of the fungus varied with the character, temperature, and moisture of the soil, the most injury occurring in poorly drained clay soils and at low temperatures. The use of long cuttings for planting resulted in smaller losses than that of short cuttings. *T. paradoxa* penetrates the cut ends and sometimes causes a complete rotting of the seed cutting before the young plants become established. *Marasmius sacchari* killed 20 percent of the buds in one planting.—(*Courtesy Biol. Abs.*)

A variety of tobacco resistant to ordinary tobacco mosaic, J. A. B. Nolla, J. S. Guggenheim, and A. Roque (*Jour. Dept. Agr. Puerto Rico, 17 (1933), No. 4, pp. 301–303*).—Data are given as showing the variety Ambalema from Colombia to be almost entirely resistant.—(*Courtesy Biol. Abs.*)

Control of tobacco wildfire.—Second report, W. S. Beach (*Pennsylvania Sta. Bul. 322 (1935), pp. 29, figs. 6*).—Leaf spot injury to tobacco in Lancaster County is due mostly to wildfire (*Bacterium tabacum*), which has become an unusually difficult problem for tobacco production. In continuation of previous studies (E. S. R., 67, p. 45) on the disease, the results obtained led to the following conclusions:

The common method of control, based on disease-free seedbeds, has often failed to prevent field development of wildfire, due largely to the fact that the bacteria may survive in infected plant parts in the field for at least 1 yr. There was no evidence that the organism survives in the soil after complete decay of tobacco plant parts or for over 2 yr. under any conditions of storage, as in tobacco barns.

Although *Physalis virginiana* often has wildfire when near diseased tobacco plants, it has not been found infected when growing apart from tobacco.

Flea beetles failed to disseminate the disease, probably because they are active only during dry weather, which is unfavorable to infection. Wildfire is also much reduced when tobacco is grown under shade, apparently due to less rain splashing and water soaking of the leaves.

Early application of fungicides in seedbeds proved important, and bordeaux mixture and copper-lime dust may be applied safely at seedtime. Complete prevention of wildfire in contaminated beds was effected by fungicides applied at seedtime or at the seed leaf stage. A spray of calomel and milk powder plus water was as effective as the bordeaux mixture in seedbeds, but it caused some stunting of the seedlings and delay in maturity. Danger from field contamination may be overcome by field sanitation, by cultural practices that will hasten the decay of tobacco refuse, and by a rotation of more than 2 yr. All locations that cannot be made sanitary by plowing after the transplanting season should be abandoned, and all equipment used in tobacco culture should be sterilized. For effective control there must be community cooperation. The seedbed is usually the greater source of infection, but very wet years tend to increase the importance of overwintering in the field and lead to contamination of land not in tobacco.

Graft versus insect transmissions of curly top in tomatoes (tomato yellows), M. Shapovalov (*Phytopathology, 25 (1935), No. 9, pp. 844–853, figs. 2*).—In these studies one of the plants of each graft pair was exposed to viruliferous beet leaf hoppers (*Eutettix tenellus*) either before or after grafting, and the effect of this exposure on both plants was observed. The results led to the following conclusions:

The infection of one of a pair of grafted plants with curly top virus did not assure its passage to the other. A certain proportion of failures to contract the disease through the graft union occurred even when grafting and inoculation were simultaneous or when grafting preceded inoculation, and it was much greater when grafting was delayed. The insect-inoculated shoot (scion) may fail not only to transmit the disease to the other plant, but it may recover from all symptoms after severance from its mother plant (base) below the graft union, or it may never develop the symptoms regardless of the condition of the base from which it was severed. The base, when severed in this way from a diseased scion, may likewise fail to show any symptoms or may recover from the disease, although the scion may continue to develop these symptoms and may transmit the infection to the healthy plant to which it is grafted. However, the number of recoveries among the bases of inoculated plants was decidedly greater than among the scions severed from them.

Physiological studies on the pathogenicity of Fusarium lycopersici Sacc. for the tomato plant, P. L. Fisher (*Maryland Sta. Bul. 374 (1935), pp. 261–281, figs. 10*).—Tomato plants of the Bonnie Best and Marglobe varieties were grown in solutions deficient in, or with excess of, B, Ca, Mg, K, N, P, and S, and inoculated with *F. lycopersici*, the cause of wilt disease. The Bonnie Best variety is susceptible and the Marglobe variety relatively resistant under normal growing conditions. Maximum infection occurred when inoculations were made before the plants were 1 mo. old.

Deficiencies of B, N, and S increased the resistance of both Bonnie Best and Marglobe, but excesses rendered them more susceptible. Deficiencies of Mg and P and excesses of Ca, Mg, and P increased the resistance, but deficiencies of K increased the resistance (in delayed inoculations) and excesses of K caused no change in the susceptibility of Bonnie Best. Deficiencies of Ca and K and excesses of K reduced the resistance, but both deficiencies and excesses of Mg and P increased the resistance of Marglobe.

Greenhouse fertilizer plats suggested that heavy applications of lime accompanying a well-balanced fertilizer (e. g., 4-10-6) would be of practical value in decreasing wilt infection.

Filtrates from 18-day-old cultures and extracts from the mats of the fungus of the same age possessed heat-stabile toxic properties and caused severe wilting to the same degree. The reaction was the same whether or not the plant roots had been removed.

Untreated juice of the Marglobe variety inhibited the growth of the *Fusarium* in pure culture, but when autoclaved or ultrafiltered it permitted normal growth. The fungus grew either in treated or untreated Bonnie Best juice.

Responses of the tomato in solution cultures with deficiencies and excesses of certain essential elements, P. L. Fisher (*Maryland Sta. Bul. 375 (1935), pp. 283–298, figs. 8*).—Tomato plants of the Marglobe variety were grown in solutions deficient in, or with an excess of, the following essential elements: B, Ca, Mg, K, N, P, and S (see also above abstract), and data were recorded on the external symptoms developed by the plants under these various treatments.

There was usually a decrease in growth and green weight in solutions deficient in any one of these elements, but the same decrease was not in every case induced by an excess of these same elements. It was apparent that the plants could make relatively good growth in concentrations of any one of the elements twice those of the control cultures, except for Ca, N, and S.

The characteristic symptoms in tomato plants grown in solutions deficient in any one of the essential elements studied were strikingly similar to those reported by McMurtrey (E. S. R., 69, p. 362) in tobacco, but the effects were usually manifested much earlier. However, these effects vary considerably according to the time of year and the environment. Because tomatoes can withstand higher concentrations of these elements in the nutrient media, no such distinctive responses could be observed among the plants treated with excesses of the various elements.

Effect of certain chemicals on the "combination streak" virus of tomatoes, M. Shapovalov (*Phytopathology, 25 (1935), No. 9, pp. 864–874*).—Most studies of the effects of chemicals on plant viruses have been made with the simple viruses. This study concerns a naturally occurring complex which may be split into (A) green tobacco mosaic and (B) latent potato mosaic. A number of chemical substances known to have a strong lytic action on certain micro-organisms were added to unfiltered tomato juices containing this virus and allowed to act for 2 hr., after which the juices were applied to young, healthy tomato plants. The results were compared with those on control plants inoculated with untreated juices, all of which showed 100 percent infection. When symptoms failed to appear within 30 days the virus was considered inactivated.

According to their activity, the chemicals used fell into three groups—(1) those showing little or no effect on either of the two virus components, (2) those with a decided lytic effect on both virus components but with virus B usually the weaker part of the complex, and (3) those with no special affinity for either virus A or B.

In the order of ascending degrees of effectiveness, the first group included bile and the two bile salts, $I_2C_6H_3COOH$, $Na_2S_2O_3$, K_2SO_4, Na_2SO_3, $K_2S_2O_8$, H_3BO_3, saponin, rotenone, thiourea, cholesterol, reuniol, and sodium ricinolate.

Methylene blue, mercurochrome, and lysol may fall in this group, although they were tested only in weaker dilutions.

The second group, in similar order of effectiveness, consisted of the unconjugated bile acids, $CuSO_4$, $KHSO_4$, $NaC_7H_5O_3$, iodine suspensoid, $Sb_2(SO_4)_3$, $Bi_2(SO_4)_3$, and H_2SO_3, the last being effective in relatively low concentrations.

The remaining chemicals tested ($CoSO_4$, $NiSO_4$, and $ZnSO_4$, and especially the first two) showed a lytic effect on both components of the virus, but, unlike the other substances tested, it was not much stronger on mosaic B than on mosaic A, since when the solution was not strong enough to kill both components, sometimes one and sometimes the other would survive. However, the data were insufficient for prediction of the results.

Contribution to the knowledge of the cryptogamic diseases of refrigerated fruits [trans. title], G. HAUSSMANN (*R. Staz. Chim. Agr. Torino Ann., 12 (1932–34), pt. A, pp. 293–308, pls. 5*).—This is a brief, general conspectus of the cryptogamic diseases of refrigerated fruits and of the factors influencing them, with special emphasis given to the varietal differences in resistance of apples to molds and with a discussion of the apple fruit rots.

Macrophoma rot of apples [trans. title], A. OSTERWALDER (*Landw. Jahrb. Schweiz, 49 (1935), No. 5, pp. 565–570, fig. 1*).—The author describes a hitherto unknown type of rot in stored apples. It commences at the base of the stem and advances into the flesh, which often turns a lilac-red but later becomes entirely blackened, as in the *Monilia* or *Phacidiella* rots. By inoculations from pure cultures the author proved the disease to be due to a filamentous fungus. On the peel and stem it formed small, black pustules, which only on the stem, and then only rarely, developed into sporiferous pycnidia. The spores related the fungus to the genus *Macrophoma*, and it most closely resembled *M. malorum*.

Contribution to the study of internal break-down of pears [trans. title], G. L. PAVARINO (*R. Staz. Chim. Agr. Torino Ann., 12 (1932–34), pt. A, pp. 215–221, pls. 5; also in Ann. Sper. Agr. [Italy], 15 (1934), pp. 23–29, pls. 5*).—In pears undergoing internal break-down there is seen an apparently normal zone that is lighter colored and more or less mealy, surrounded by a blackish, altered endocarp and an external browned zone formed of spongy, necrotic tissue between the narrow zones of the radiating parenchyma. The vascular phase, typical of the disease, is characterized by initial alterations of the vascular system which appear more or less deeply browned below the radiating parenchyma. With variations in the anatomical characters of the fruit the disease assumes diverse macroscopic appearances, but the general picture remains typically the same in the different varieties of pears. The macroscopic and histological characters of the disease are illustrated in color. Pears with a granular pulp and less abundant spongy tissue appeared to be most resistant to the malady.

A study of peach yellows and its insect vector, A. HARTZELL (*Contrib. Boyce Thompson Inst., 7 (1935), No. 2, pp. 183–207, figs. 7*).—The history, distribution, and symptomatology of peach yellows are reviewed and the suscepts (peach, nectarine, almond, apricot, and Japanese plum) named. From the investigation the following results were obtained:

The disease was experimentally transmitted by both nymphs and adults of the plum and peach leaf hopper (*Macropis trimaculata*) from affected peach trees to 14 healthy, young peach seedlings, about 16 percent of the trees exposed becoming infected. On the other hand, 47 other species of insects and mites failed to transmit the disease.

Yellows was also experimentally transmitted by budding. Diseased pollen or mechanical inoculation failed to induce infection.

The habits of the vector differ markedly from those of most leaf hopper species. This fact, together with the paucity of its population on peach trees, has undoubtedly delayed its detection as the vector. A study of its life history, habits, and population was made, and a positive correlation of this vector to wild plum and the incidence of the disease was noted.

The removal of wild plums from the vicinity of peach orchards and the roguing of affected trees are suggested methods of control.

A new bacterial species isolated from strawberries, H. F. Smart (*Jour. Agr. Res.* [*U. S.*], *51* (*1935*), *No. 4, pp. 363, 364*).—The same bacterial species was observed in great numbers in many samples of fresh strawberries going into frozen pack. Samples were studied in 1929 from stations in Norfolk, Va., Fruitland, Md., and Selbyville, Del., and in 1930 at Portsmouth, Va. Plates from all four localities showed it to be the predominating organism in the fresh berries, whether or not they were washed before sampling. This organism, which occurs principally on the outside of the fruit and, so far as is known, has no bad effect on strawberries, is here named and described as *Achromobacter delmarvae* n. sp.

Grape scald: Experiments with the variety Regina [trans. title], F. Scurti and G. L. Pavarino (*R. Staz. Chim. Agr. Torino Ann.*, *12* (*1932–34*), *pt. A, pp. 211–214, pls. 3; also in Ann. Sper. Agr.* [*Italy*], *15* (*1934*), *pp. 19–22, pls. 3*).—Grape scald is attributed to the action of light on the chloroplasts and on the tannin substances present in the grapes. The sun's rays disorganize the chloroplasts and condense the tannin materials, transforming the latter into phlobaphene derivatives, and as an accessory cause, high temperatures induce coagulation and darkening of the cellular contents. In cold storage the disease is checked, but when the grapes are returned to ordinary temperatures it not only continues to develop but the grapes soon become infected with fungi. The macroscopic and histological features of the malady are illustrated in color.

Sulfur dioxide for the preservation of table grapes [trans. title], F. Scurti and G. Pavarino (*R. Staz. Chim. Agr. Torino Ann.*, *12* (*1932–34*), *pt. A, pp. 271–282, pls. 7*).—Sulfur dioxide proved to be an economical and effective disinfectant for table grapes. However, since some varieties (e. g., Italia, Perlona, Ohanez, Bicane, Regina, and Incrocio Pirovano) were particularly sensitive to the action of this gas, even at a concentration as low as 2 percent, its use without due caution may lead to serious results. Indeed, it may exercise a caustic and reducing action manifest by discoloration of the green parts of the stems and serious burning of the berries. The waxy bloom and the cuticular layer are incapable of arresting the progress of the gas, which penetrates into the tissues and induces more or less deep-seated changes.

In cold storage, with prolongation of treatment, there follows a disorganization of the chloroplasts, changes in the vascular system, and deformation of the cells in which the contents become plasmolyzed and reduced to a reddened, amorphous mass. As a rule the action of the gas is arrested only by the outer envelope of the seed, the ultimate barrier being the sclerotic tegument. When such grapes are returned to ordinary temperatures, a rapid break-down of the tissues follows.

The black grapes show a higher resistance to the gas, but even in them, with prolonged application, the pathological process finally leads to these alterations in the tissues.

Areolate spot of citrus caused by Leptosphaeria bondari, A. A. Bitancourt and A. E. Jenkins (*Phytopathology*, *25* (*1935*), *No. 9, pp. 884–886, fig. 1*).—Areolate spot of citrus, formerly reported from Brazil, has recently been extended to include in its range also Dutch Guiana and Venezuela. Bondar

(E. S. R., 63, p. 254), in first reporting the disease from Brazil in 1929, identified the *Leptosphaeria* associated with it as *L. citricola*, which produces a different type of spot. The South American fungus is here described as *L. bondari* n. sp.—(*Courtesy Biol. Abs.*)

A new method of revealing bruises in citrus fruits [trans. title], G. HAUSSMANN (*R. Staz. Chim. Agr. Torino Ann., 12 (1932–34), pt. A, pp. 247–251, pls. 3; also in Ann. Sper. Agr. [Italy], 15 (1934), pp. 55–59, pls. 3*).—The method described involves the use of ultraviolet rays, and the results obtained are illustrated in color.

Ocherous erosion of the rind of blood oranges during cold storage: Contribution to a study of the nature of oleocellosis [trans. title], F. SCURTI and G. L. PAVARINO (*R. Staz. Chim. Agr. Torino Ann., 12 (1932–34), pt. A, pp. 199–205, pls. 3; also in Ann. Sper. Agr. [Italy], 15 (1934), pp. 7–13, pls. 3*).—The ocherous spots forming on the rind of blood oranges during storage are attributed to the fact that low temperatures impede the evaporation of the essential oils, which normally volatilize from the superficial layers of the epicarp. Their liberation is inhibited because the rind becomes so stiffened by the low temperatures that it loses the elasticity necessary for their physiological expulsion. Thus they collect in the intercellular spaces of the rind and finally induce corrosion of the superficial tissues. The external macroscopic and the internal histological characters are figured in colors.

White spot of pineapples, M. T. COOK (*Jour. Dept. Agr. Puerto Rico, 17 (1933), No. 4, pp. 311–313*).—A disease apparently the same as the one here reported was studied in Hawaii and attributed to *Thielaviopsis paradoxa* (E. S. R., 24, p. 746). Since that time a white spot on leaves has been reported from several places in the West Indies and attributed to the same cause. The author's studies in Puerto Rico showed that these spots develop in greater or less abundance during cloudy, rainy weather, and without any infection by this fungus.—(*Courtesy Biol. Abs.*)

Survival and revival of Anguillulina dipsaci from narcissus material, G. W. SHERMAN (*Helminthol. Soc. Wash. Proc., 1 (1934), No. 1, pp. 19, 20*).—From numerous preliminary tests it appeared that the preadult stage is most resistant to desiccation and to hot water and vapor heat treatments. Specimens were shown to revive after periods up to a week. Heat treatments of narcissus bulbs were more effective if the dormant nemas were first revived.

Transfer of Diaporthe umbrina to the genus Cryptosporella, A. E. JENKINS and L. E. WEHMEYER (*Phytopathology, 25 (1935), No. 9, pp. 886–889, fig. 1*).—Prior to the classification of the ascomycete causing brown canker of the rose in the genus *Diaporthe* as *D. umbrina* on the basis of pseudoseptate spores, the fungus was regarded as a *Cryptosporella*. During subsequent studies, in which many specimens with the perfect stage of *D. umbrina* were examined, the spores were always unicellular. Therefore, the fungus is here transferred to *Cryptosporella* as *C. umbrina*. Certain Louisiana material of *Diaporthe* from the rose, apparently *D. eres*, served to illustrate the very close relationship of these two genera and species. The *Diaporthe*, however, produced both α and β conidia, and its ascospores soon became septate. On the basis of their α and β conidia, at least two other strains of *Phomopsis* from other sources are distinct from *D. eres*, but it is probable that they all represent the same species complex.—(*Courtesy Biol. Abs.*)

Twig blight of the American bladder nut caused by Hypomyces ipomoeae, W. H. DAVIS (*Mycologia, 27 (1935), No. 5, pp. 527–542, figs. 3*).—A twig blight of bladdernut (*Staphylea trifolia*) was first noted during 1929 and seemed to be widely distributed in the Connecticut Valley. Working at the Massachusetts State College, the author found *H. ipomoeae* f. *staphyleae* n. f. to be the cause. The disease starts during the spring and summer from the penetration of meristematic tissues by the germinating ascospores and macroconidia. Secondary infection occurs by the advance of the hyphae through the phloem into the older twigs. The ascospores, macroconidia, and hyphae overwinter within the bladdernut. No other host was observed. Five measures for control of the disease are suggested.

Dutch elm disease eradication in the United States, L. H. Worthley and O. N. Liming (*Jour. Econ. Ent., 28 (1935), No. 3, pp. 524–528*).—This summarizes the history of the European situation with regard to the Dutch elm disease and its introduction and distribution in the United States; reviews studies on the fungus, its pathogenesis in the host, and the role of insects in its spread; states the objectives and results of the eradication program; and outlines the projected work of the governmental agencies and the manner in which entomologists and pathologists can render assistance.

Progress of Dutch elm disease eradication, [R. P. White] (*New Jersey Stas. Nursery Disease Notes, 8 (1935), No. 4, pp. 14–18; abs. in U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 19 (1935), No. 17, pp. 270–273*).—This report from the New Jersey Experiment Stations is a semipopular account of the general progress made in this control and eradication project.

Research during 1934 on Ceratostomella ulmi, the cause of the Dutch elm disease, R. K. Beattie (*Jour. Econ. Ent., 28 (1935), No. 3, pp. 528–531*).—The log-carrier theory of the introduction of this disease into the United States is further confirmed. The oldest infection yet found was at Indianapolis, Ind., in 1926. A search for other possible means of entry of this fungus revealed the fact that for many years cheap dishes had been shipped from England in rough crates from which the bark was not removed. At New York such crates, made of elm, were found to carry live beetle larvae and brown streaks, but no traces of the *Graphium* form of *C. ulmi*.

During a period of 1 yr., 16,872 specimens from suspected areas were cultured at the Dutch elm disease laboratory at Morristown, N. J., and 49 percent showed the presence of *Graphium*.—(*Courtesy Biol. Abs.*)

Resistance of Pinus sylvestris to a gall-forming Peridermium, W. G. Hutchinson (*Phytopathology, 25 (1935), No. 9, pp. 819–843, figs. 4*).—Trees of ***Pinus sylvestris*** proved by inoculation to be resistant to a species of ***Peridermium*** occurring in the vicinity of Woodgate, N. Y., showed no histological differences in stem structure from susceptible ones.

Three general types of reaction to inoculation were distinguished: (1) Typical gall formation on susceptible hosts, (2) cracking of the bark and slight resinosis sometimes followed by development of atypical galls on partially resistant hosts, and (3) formation of small, necrotic areas on twigs, followed sometimes by swellings not increasing in size after the first or second year, but which are gradually sloughed off. In the most susceptible trees the mycelium may live in a somewhat mutualistic relationship, resulting in the stimulation of living cells and in gall formation. In the most resistant trees the host cells are killed immediately after invasion, resulting in death of the fungus and sloughing off of the necrotic area. In both susceptible and resistant trees the cells first invaded often become filled with tannin, which may represent a local immunity.

In resistant trees developing swellings the mycelium grows to the cambium and then dies, and areas of necrotic tissue extend from that point outward. The cambium is stimulated to form quantities of wound wood, including tangentially enlarged tracheids, giant cells, and tyloses in the tracheids and resin ducts. The necrotic areas become surrounded by cork and later by sclerenchyma, probably a normal reaction to wounding of the cells which may play a small role in resistance.

No correlation was seen between the osmotic pressure or H-ion concentration of the cell sap and resistance, but a larger amount of potassium was found in the noninfected resistant than in the susceptible stems. The latter may have some relationship to resistance on the basis of nutrition.

It is believed that the liberation of toxin into the cells by the haustoria may cause the death of the hypersensitive cells of resistant hosts, thus depriving the fungus of food and causing its death. However, in susceptible trees the toxin does not kill the cells at once but rather stimulates them to gall formation.

Contributions to the knowledge of the sap stains of wood in Japan, II, III, Y. NISIKADO and K. YAMAUTI (*Ber. Ōhara Inst. Landw. Forsch., 6 (1934), No. 3, pp. 467–490, pls. 5; 6 (1935), No. 4, pp. 539–560, pls. 5*).—This series of studies (E. S. R., 69, p. 680), is continued.

II. *Studies on Ceratostomella pini Münch, the cause of a blue stain of pine trees.*—The authors found that in Japan *C. pini* generally occurs on *Pinus densiflora* and *P. thunbergii.* It attacks the felled trees and also standing trees, if weakened by the attack of bark beetles or by other causes. As in *C. ips*, the hyphae penetrate through the parenchymatous cells of medullary rays from the cortex toward the center, and grow through the resin ducts and the tracheids longitudinally and through the bordered pits tangentially. The fungus develops small, short-beaked perithecia among the large, irregular sclerotia. Conidia are produced apically in a ball of *Cephalosporium* type. Conidiophores of the *Graphium* type, such as occur in *Ceratostomella piceae*, have not been observed.

Conidia lose their vitality when kept in water at 52° C. for 15 min., at 54° for 5 min., and for 1 hr. in 1:6,000 solution of mercuric chloride or in 1:200 solution of formalin. Growth in 1 percent malt-extract solution was checked by the addition of mercuric chloride at 1:100,000 and of copper sulfate, iron, or Uspulun at 1:10,000. Without free oxygen, neither conidial germination nor mycelial growth takes place.

III. *Studies on Ceratostomella piceae Münch, the cause of a blue stain of pine trees.*—The authors list 12 species of coniferous and deciduous woods on which *C. piceae* is found in Japan.

As in *C. ips* and *C. pini*, the hyphae penetrate the parenchymatous cells of the medullary rays from the cortex toward the center, while they grow through the resin ducts and tracheids longitudinally and through the bordered pits tangentially. *C. piceae* is described and compared with other species, and its cultural characters are given. Both conidia and ascospores are killed by treatment in water at 52° C. for 10 min., or at 50° for 15 min., and by immersion in 1:4,000 mercuric chloride solution or in formalin or Uspulun at 1:200. The fungus is unable to grow in malt-extract agar containing mercuric chloride or Uspulun at 1:10,000 or copper sulfate at 1:5,000 concentration.

Dichotomophthora portulacae, a pathogene of Portulaca oleracea, F. P. MEHRLICH and H. M. FITZPATRICK (*Mycologia, 27 (1935), No. 5, pp. 543–550, figs. 3*).—During the course of work at the Hawaiian Pineapple Producers' Experiment Station on the control of this troublesome weed, the authors found that epiphytotics were being caused by a hyphomycetous fungus, which is here illustrated and described as *D. portulacae* n. g. and sp.

Patho-anatomy of roots attacked by nematodes, M. T. COOK (*Jour. Dept. Agr. Puerto Rico, 17 (1933), No. 4, pp. 315–319, pl. 1*).—The anatomical changes in the roots of tomato, tobacco, and coleus infested with *Heterodera marioni* (*H. radicicola*) are described. The nematodes attack only the meristematic tissues, but the fibrous and tracheary tissues are frequently pushed out of place. The cambium, cortex, and medullary rays are stimulated to excessive cell division, and tracheary tissue develops in the cortex. During gall formation the cells next to the parasites are very small as a result of this rapid cell division. Large galls appear to develop as a result of repeated attacks by succeeding generations of nematodes.—(*Courtesy Biol. Abs.*)

ECONOMIC ZOOLOGY—ENTOMOLOGY

Governmental problems in wild life conservation, R. H. CONNERY (*New York: Columbia Univ. Press; London: P. S. King & Son, 1935, pp. 250*).—Following a statement of the problems, methods, and limitations of study, the several chapters deal with the changing place of wildlife in the national economy (pp. 15–30), the sphere of the Federal Government in wildlife conservation (pp. 31–52), the sphere of State government in wildlife conservation (pp. 53–80), the organization and functions of the Bureau of Biological Survey (pp. 81–114), the organization and functions of the Bureau of Fisheries (pp. 115–143), the reorganization of Federal conservation agencies (pp. 144–176), the organization and functions of the State conservation departments (pp. 177–202), problems of game law enforcement (pp. 203–225), and conclusions (pp. 226–232). A classified bibliography of 14 pages is included.

Officials and organizations concerned with wildlife protection, 1935, compiled by F. G. GRIMES (*U. S. Dept. Agr., Misc. Pub. 231 (1935), pp. 16*).—This is the thirty-fifth annual edition of this directory (E. S. R., 72, p. 650).

Game laws for the season 1935–36: A summary of Federal, State, and Provincial statutes, H. P. SHELDON and F. G. GRIMES (*U. S. Dept. Agr., Farmers' Bul. 1755 (1935), pp. II+38*).—This is the thirty-sixth annual summary of the Federal and other game laws and regulations (E. S. R., 72, p. 356).

Mammalian life histories from Barro Colorado Island, Panama, R. K. ENDERS (*Bul. Mus. Compar. Zool., 78 (1935), No. 4, pp. 383–502, pls. 5*).—This report of observations from 1929 to 1935 is presented with a list of 69 references to the literature.

Food habits of the coyote in Jackson Hole, Wyo., O. J. MURIE (*U. S. Dept. Agr. Circ. 362 (1935), pp. 24*).—The results of an investigation in Jackson Hole, commenced in the summer of 1927 and extending over 4 yr., are reported.

The 778 stomachs and feces examined contained 2,415 separate items, of which the 1,629 noncarrion items representing mammals and birds are of chief economic significance. Of the 24 species of mammals and birds found to be preyed upon by the coyotes of that section, 6 may be held to indicate economically beneficial food habits, 10 neutral, and 8 harmful. On the basis of the 1,629 bird and mammal food items, 70.29 percent are in the beneficial class, 18.22 neutral, and only 11.49 percent harmful.

"The statistics on losses of elk calves in Jackson Hole reveal that those chargeable to coyotes are not serious, and that while coyotes (as well as bears) to some extent persistently prey on elk calves, this does not become a serious factor in the elk-management problem. Winter killing, the ravages of disease, and hunting constitute the principal drain on the elk herd, and even though the coyotes were entirely eliminated it is improbable that any material increase in the herd would result thereby or that the problems in elk management would be materially alleviated."

It is pointed out that the study has not revealed that coyotes are a serious menace to the deer or mountain sheep, although further work is considered necessary for assembling precise data on the ecology of these two animals.

A study of the life history and food habits of mule deer in California, J. S. DIXON (*Calif. Fish and Game, 20 (1934), Nos. 3, pp. 181–282, figs. 65; 4, pp. 315–354, figs. 20*).—This report of studies of the mule deer, the most important species of game mammal in California and represented by five forms, treats of its identification, distribution in California, characters, general habits, breeding habits, natural enemies, diseases, and food habits.

Ecology and life history of the porcupine (Erethizon epixanthum) as related to the forests of Arizona and the southwestern United States, W. P. TAYLOR (*Ariz. Univ. Bul., 6 (1935), No. 5, pp. 177, figs. 27*).—The biology, natural enemies, and control of *E. epixanthum* are reported upon at length.

Serious porcupine damage was found chiefly on ponderosa pine in limited localities on five national forests in the southwestern region: Coconino and Tusayan (Ariz.), Carson and Cibola (N. Mex.), and San Juan (Colo.). Damage may be done by porcupines either in virgin timber or in cut- or burned-over areas, but it is likely to be greatest where natural conditions are most disturbed. Porcupines may work on trees of almost any size. Their most serious injury is done to saplings and poles (3 ft. high to 10 in. in diameter breast high). Seedlings possess remarkable recuperative ability, and there is no question that many young trees, thought seriously damaged, recover and grow into nearly normal form. As compared with the economic destructiveness of the animal, its recognized benefits are slight.

"In winter the porcupine's movements are very limited It may spend several weeks or even months in the same tree or group of trees. Damage to larger pines is done chiefly at that season. When the snow has gone off the ground in the spring, summer, and fall, the porcupine feeds largely on ground herbage, also consuming the bark of smaller pines.

"In control of the porcupine, advantage is taken of porcupine travel ways and of the animal's predilection for certain trees and caves. Control areas for porcupines should be as large as necessary to protect the forest, but as restricted as possible, due to the inevitable expense involved, the law of diminishing returns, and the fact that additional disturbance of natural conditions should be effected only where it is rather overwhelmingly justified."

A 6-page list of references is included.

The parasites of British birds and mammals.—IV, Records of mammal parasites, G. B. THOMPSON (*Ent. Mo. Mag., 3. ser., 21 (1935), No. 249, pp. 214–216*).—A continuation of the accounts previously noted (E. S. R., 73, p. 539).

On the spontaneous septicemia of mice in the outskirts of Astrakhan in 1933–34 [trans. title], T. V. FEDOROVA and G. A. LALAZAROV (*Vest. Mikrobiol., Épidemiol. i Parazitol. (Rev. Microbiol., Épidémiol. et Parasitol.), 14 (1935), No. 1, pp. 51–56; Eng. abs., pp. 55, 56*).—Under the name *Bacillus muricidae* an organism pathogenic for gray mice (*Mus musculus*) in Astrakhan but harmless for other animals is described as new.

Eliminating bats from buildings, J. SILVER (*U. S. Dept. Agr. Leaflet 109 (1935), pp. II+5, figs. 2*).—A practical account of bat control.

[Ruffed grouse investigations], L. OSBORNE (*N. Y. State Conserv. Dept. Ann. Rpt., 24 (1934), pp. 273–287*).—This fifth report of grouse investigations (E. S. R., 73, p. 806) includes observations of their diseases and parasites and the incidence of pathological findings in wild grouse during 1933–34, the details being given in tabular form.

Biological control of an insect pest by a toad, H. L. VAN VOLKENBERG (*Science, 82 (1935), No. 2125, pp. 278, 279*).—Contributing from the Puerto Rico Experiment Station, it is pointed out that the feeding of the giant toad (*Bufo marinus* L.), which was introduced from Barbados into Puerto Rico in 1920 and by the Insular Experiment Station in 1923–24 from Jamaica, has resulted in changing the status of the native white grub (*Phyllophaga* spp.), the most serious and generally destructive insect pest of agricultural crops in Puerto Rico, from a major to a minor enemy of sugarcane.

Host-parasite relations between parasitic Protozoa and their hosts, D. H. WENRICH (*Amer. Phil. Soc. Proc., 75 (1935), No. 7, pp. 605–650, pls. 5*).—This contribution is accompanied by a list of 89 references to the literature.

Recent progress in insect physiology, W. M. Hoskins and R. Craig (*Physiol. Rev., 15 (1935), No. 4, pp. 525–596*).—A review of the subject presented with a list of 458 references to the literature.

The relation of cell size to growth in insect larvae, W. Trager (*Jour. Expt. Zool., 71 (1935), No. 3, pp. 489–508, figs. 6*).—It was found that the entire growth of larvae of *Lucilia sericata* Meig. is a result of an increase in the size, not the number, of the cells composing the larval tissues. It is shown that in larvae of the silkworm the type of growth varies with the different tissues in the different instars. Of the tissues studied, only the silk glands and certain dorsal body wall muscles grow purely by increase in cell size.

[Contributions on economic insects, insecticides, and insect control] (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., 1935, E–360, pp. 4; E–361, pp. 3*).—Continuing the series previously noted (E. S. R., 74, p. 227), a Memorandum regarding a Weevil [*Calomycterus setarius* Roelofs] Native to Japan Now Known to Occur in the United States, by C. A. Weigel, and the Preparation of Spray Solutions from Tobacco are presented in mimeographed form.

Entomological service, D. B. Mackie (*Calif. Dept. Agr. Mo. Bul., 23 (1934), No. 12, pp. 396–418*).—This annual report of the entomological service of the California Department of Agriculture deals with regulatory work with the citrus white fly, the parlatoria date scale, Hall's scale (*Lepidosaphes halli*), the obscure scale, the white snail *Helix pisana*, and other pests; with field work, including insect problems relating to standardization and insecticidal residue problems, pest control by airplane, etc.; and with insect pest surveys.

Report of insect and other animal and plant disease interceptions at California plant quarantine inspection points for 1934, A. C. Fleury (*Calif. Dept. Agr. Spec. Pub. 134 (1935), pp. 66*).—Plant pests intercepted during the year 1934 are listed alphabetically by their scientific names, followed by an indication of the host and its origin.

[Work in entomology by the Georgia Station] (*Georgia Sta. Rpt. 1935, pp. 24–30, figs. 2*).—The work of the year briefly referred to (E. S. R., 71, p. 809) relates to the southern corn rootworm; the flat-headed borers in pecan (the flat-headed apple tree borer, *Chrysobothris chrysoela* (Ill.), *Actenodes acornis* (Say), and *Acmaeodera tubulus* (Fab.)), particularly the flat-headed apple tree borer; the pecan weevil; the screwworm *Cochliomyia americana* C. & P.; and miscellaneous insects, including the vegetable weevil, May beetles (*Phyllophaga* sp.), the sugarcane beetle, a small caterpillar (*Pachyzancla periusalis* Walk.) on the leaves of tomato and eggplant, a large prionid root borer in muscadine grape vines, insects instrumental in the pollination of muscadine grapes, and the bollweevil.

Insects of Indiana for 1934, J. J. Davis (*Ind. Acad. Sci. Proc., 50 (1934), pp. 198–206*).—Contributing from the Indiana Experiment Station, the author presents a brief account of the occurrence of the more important insect enemies of field crops, vegetables, fruit, shade trees and shrubs, and flowering plants, and other pests in 1934.

[Contributions on economic insects in Iowa] (*Iowa State Hort. Soc. Rpt., 69 (1934), pp. 83–101, 239–244, figs. 9*).—Contributions from the Iowa Experiment Station presented at the annual meeting of the Iowa State Horticultural Society held at Ames in November 1934 (E. S. R., 72, p. 654) are as follows: Codling Moth Bait Trap Records for 1934 (pp. 83–89), Experiments in Codling Moth Control, Summer, 1934 (pp. 89–93), and Comments on the History of the Codling Moth in Iowa (pp. 94–101), all by T. R. Hansberry and C. H. Richardson; and Controlling the Gladiolus Thrips in Iowa, by H. D. Tate (pp. 239–244).

[Report of work in zoology and entomology at the Pennsylvania Station] (*Pennsylvania Sta. Bul. 320 (1935), pp. 28–31*).—The work of the year at the station (E. S. R., 72, p. 807) briefly referred to includes wireworm control (the wheat wireworm and *Pheletes agonus*), nicotine dusts for control of mushroom insects, and insecticides for control of the tomato pinworm, all by C. A. Thomas; number of broods and control of the oriental fruit moth and the use of oil sprays for aphids and red mites, both by S. W. Frost; control of the codling moth, by H. N. Worthley; and codling moth research in 1934, by Worthley and L. C. Marston.

Insects injurious to cultivated plants: Their biology and control, I, A. BALACHOWSKY and L. MESNIL (*Les Insectes nuisibles aux plantes cultivées: Leurs moeurs, leur destruction. Paris: Étab. Busson, 1935, vol. 1, pp. XVI+1137, pls. 7, figs. 981*).—The first volume of this treatise on the agricultural entomology of France, Corse (Corsica), North Africa, and the neighboring regions, following a preface by P. Marchal, deals with the subject in three chapters, chapter 1 (pp. 3–627) being devoted to insects injurious to fruits and nuts, chapter 2 (pp. 629–735) to insects injurious to the grape, and chapter 3 (pp. 737–1137) to insects injurious to cereals and meadow grasses.

Some more injurious insect pests of crops (*Bengal Dept. Agr. Bul. 1 (1934), pp. [3]+6+[1]*).—Brief accounts are given of the more important pests of rice, jute, and sugarcane in Bengal.

Insect resistance in crop plants, J. H. PARKER (*Northwest. Miller, 183 (1935), No. 9, pp. 805, 806, fig. 1*).—A practical review contributed from the Kansas Experiment Station.

Insect pests of glasshouse crops, H. W. and M. MILES, edited by H. C. LONG ("*The Birkins*", *Orchard Road, Hook, Surbiton, Surrey, Eng.: H. C. Long, 1935, pp. 174, pls. 21, figs. 15*).—Following a foreword by J. C. F. Fryer, this practical account is presented in nine chapters and two appendixes. The first of the appendixes consists of an alphabetical list of the chief greenhouse crops, with associated pests and their characteristic injury, and the second of a selected bibliography.

Spray program for fruit insect control in 1935, C. O. EDDY (*Ky. State Hort. Soc. Trans., 1934, pp. 134–143*).—A contribution from the Kentucky Experiment Station.

Biology and control of avocado insects and mites, H. L. MCKENZIE (*California Sta. Bul. 592 (1935), pp. 48, figs. 27*).—Following a brief introduction and a key to the diaspine scales attacking the avocado in California, the more important insect pests of this fruit are considered. Particular attention is given to the *Latania* scale *Aspidiotus lataniae* Sign., the omnivorous looper *Sabulodes caberata* Gn., *Amorbia essigana* Busck, the avocado red mite, the greenhouse thrips, and the broadnosed grain weevil *Caulophilus latinasus* Say. A list of the avocado pests of lesser importance in California, a list of the avocado pests of the world (by countries), and a bibliography of five pages are included.

Insect pests of citrus-trees in Formosa, III, T. SHIRAKI (*Jour. Soc. Trop. Agr. (Nettai Nôgaku Kwaishi), 6 (1934), No. 4, pp. 697–703*).—This is in continuation of the account previously noted (E. S. R., 72, p. 820).

Successful examples of biological control of pest insects and plants, H. L. SWEETMAN (*Bul. Ent. Res., 26 (1935), No. 3, pp. 373–377*).—This discussion is accompanied by tabulated lists of the most striking examples of successful control of insect and plant pests by biological methods.

Quantitative studies on the lethal action of X-rays upon certain insects, K. KOIDSUMI (*Jour. Soc. Trop. Agr. (Nettai Nôgaku Kwaishi), 2 (1930), No. 3, pp. 243–263, figs. 5; Japan. abs., p. 263*).—The studies reported have shown that *Dacus cucurbitae* Coq. and *D. dorsalis* Hendel, which damage various kinds of fruits and vegetables in Taiwan (Formosa), can be killed by certain amounts of X-ray irradiation in any stage of their life cycle. The resistance of the insects to X-rays becomes higher and higher as the development proceeds from egg to full-grown larva; at the beginning of pupation resistance falls rapidly, and then the progressive high resistance continues to the emergence of adult.

Comparative toxicity of anabasine and nicotine sulphates to insects, J. M. Ginsburg, J. B. Schmitt, and P. Granett (*Jour. Agr. Res.* [*U. S.*], *51* (*1935*), *No. 4, pp. 349–354*).—In this contribution from the New Jersey Experiment Stations the authors report on cooperative laboratory and greenhouse tests made of anabasine, an alkaloid present in the stems and leaves of *Anabasis aphylla*, of the family Chenopodiaceae, and nicotine sulfate on several species of aphids, silkworm moth larvae, grasshoppers, and honeybees. The work has shown that anabasine sulfate equals or excels nicotine sulfate in toxicity to the bean aphid, apple aphid, and the chrysanthemum aphid and is decidedly more toxic to *Rhopalosiphum rufomaculata* Wils. and the rose aphid. Anabasine sulfate was found to possess very little toxicity as a stomach poison against silkworm larvae, while nicotine sulfate proved highly toxic to it. It was decidedly less toxic to grasshoppers, applied as a stomach poison, than was nicotine sulfate.

The toxicity of optically active and inactive dihydrodeguelins, W. A. Gersdorff (*Jour. Agr. Res.* [*U. S.*], *51* (*1935*), *No. 4, pp. 355–361, figs. 2*).—The results obtained in a study made of the toxicity to goldfish of active and inactive dihydrodeguelins have been compared by the author with each other and with those obtained with rotenone and deguelin. "Three criteria were used as the basis of these comparisons—the maximum rate of increase of velocity with increase in concentration, tan θ; the minimum product of concentration and time, $(ct)_m$; and Powers'[3] formula, $\sqrt{\frac{\tan\theta}{c_0}}$, where c_0 is the theoretical threshold of toxicity. According to all these criteria the following descending order of toxicity was found: Rotenone, active dihydrodeguelin, deguelin, and inactive dihydrodeguelin.

"Optically active dihydrodeguelin has essentially the same toxicity as rotenone between the concentrations 0.2 and 0.9 mg per liter. At lower concentrations rotenone is increasingly more toxic, approaching a maximum ratio of about 2 to 1. Active dihydrodeguelin is more than twice as toxic as the inactive derivative. According to a comparison of the minimum *ct* products, the relative value is 2.2. Active dihydrodeguelin is 1.33 times as toxic as inactive deguelin. This ratio is about the same as that (1.48) of the toxicities for active dihydro derivatives of rotenone to those of their parent compounds."

Efficiency of commercial sodium cyanide and sulphuric acid in liberating hydrocyanic acid gas for fumigation, M. Shafik and A. A. Amer (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 160* (*1935*), *pp. 6, figs. 2*).—A brief report of a work aimed at the determination of the least amount of sulfuric acid which gives off an efficient yield of hydrocyanic acid gas in combating the Florida red scale.

A nonflammable pyrethrum spray for use in airplanes, C. L. Williams and W. C. Dreessen (*Pub. Health Rpts.* [*U. S.*], *50* (*1935*), *No. 41, pp. 1401–1404*).—In further work (E. S. R., 73, p. 512) it was found that even when the kerosene portion of a mixture of 1 part of pyrethrum extract in kerosene (2 percent pyrethrins) and 4 parts of carbon tetrachloride extract (2 percent pyrethrins) is as little as one-fifth, the lethal effect on the yellow-fever mosquito is the same as when much larger proportions of kerosene base are used. The mixture killed 100 percent of the yellow-fever mosquitoes in 5 min.

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[3] Powers used c instead of c_0 to indicate the threshold of toxicity concentration.

when sprayed in amounts of 5 cc per 1,000 cu. ft. The varying mixtures when used in amounts of 5 or 10 cc per 1,000 cu. ft. did not cause noticeable irritation or other symptoms to observers remaining in the room up to periods of 15 min.

A mixture of 1 part of pyrethrum extract in kerosene (containing 2 percent pyrethrins) and 4 parts of carbon tetrachloride (containing no pyrethrins) was tested in one experiment. Five cc per 1,000 cu. ft., with 5 minutes' exposure, killed 100 percent of exposed yellow-fever mosquitoes (50 males, 24 females). By ordinary tests this mixture is nonflammable.

An experimental analysis of the sexual behavior of the praying mantis (Mantis religiosa L.), K. D. Roeder (*Biol. Bul., 69 (1935), No. 2, pp. 203–220, figs. 13*).—Observations of the habits of this predator in the laboratory during four successive generations are reported, with a list of 14 references to the literature.

The effects of intestinal poisoning on the blood of locusts (Locusta migratoria), M. Pilat (*Bul. Ent. Res., 26 (1935), No. 3, pp. 283–292, figs. 73*).—The author concludes that "the picture of the blood of an insect affected by intestinal poisoning is a very complicated phenomenon. Until precise and uniform principles for the classification of the formed elements of the hemolymph of insects have been established, it will be quite impossible to give a numerical expression (hemogram) for the picture of the blood after poisoning. All such hemograms would now be utterly conventional and of small utility in the hands of other investigators."

Thrips injury to peach nursery stock, C. O. Eddy and L. Hillenmeyer (*Ky. State Hort. Soc. Trans., 1934, pp. 161-165*).—Observations by the Kentucky Experiment Station in 1934 of two fields of peach nursery stock located on good soil in the center of the bluegrass region of the State, one field consisting of seedling stock and the other of 1-year-old budded stock, led to the discovery that the injury known as "stop back", thought until 1934 to be of bacterial origin, is caused by the attack of thrips. Their attack results in the cessation of growth usually during late May and June, when trees are 18 in. to 3 ft. high and when growth is rapid and the trees succulent. The injury is so severe at times that practically an entire block of 50 or 60 thousand trees shows some effects. Injury similar to that described for peach nursery stock has occurred on cherry nursery stock, although it has been less pronounced and recovery has been more rapid.

Three general types of injury are recognized, the most severe being caused by thrips feeding on only one side of the tip of the growing, upright terminal. There they excavate round or oval holes that reach nearly through the stem, resulting in the tip bending over and in extreme cases being perpendicular to the main stem and becoming dwarfed or dying. The second type is due to thrips feeding on leaf areas and in unfolding buds, that on the minute petiole or leaf area causing many types of injury. The third type is due to longitudinal shallow fissures between the nodes caused by feeding on the well-protected tip.

It is pointed out that the thrips may cause a larger part of the cat-facing of peach fruit in the State than was formerly attributed to them.

In control work sprays of nicotine sulfate applied at the rate of 1 pt. to 100 gal. with a spreader and foliafume were found satisfactory, the former being the cheaper. The spreaders that were used with satisfactory results included 40 percent liquid soaps (4 pt. to 100 gal.), tar soap chips (2 lb. to 100 gal.), and a new preparation developed by the station tentatively called "No. 385" (1 pt. to 100 gal.).

The gladiolus thrips in Colorado, G. M. List (*Colo. State Ent. Circ. 64* (*1935*), *pp. 15, figs. 5*).—A summary of information on the gladiolus thrips, which was collected for the first time at Fort Collins in July 1933 and is now found in practically every section of the State where the gladiolus is grown.

A new species of Thysanoptera from S. India (Taeniothrips cardamomi sp. nov.), T. V. Ramakrishna Ayyar (*Bul. Ent. Res., 26* (*1935*), *No. 3, pp. 357, 358*).—*T. cardamomi*, which has done appreciable damage to cardamom capsules on an estate in Madras (see below), is described as new.

A new disease of cardamom (Elettaria cardamomi) apparently due to insect damage in south India, T. V. Ramakrishna Ayyar and M. S. Kylasam (*Bul. Ent. Res., 26* (*1935*), *No. 3, pp. 359–361, pl. 1*).—Attacks of the tender blossoms and pods of growing cardamoms on a large estate in the Anamalai Hills of south India which ruined the appearance of fully 50,000 lb. of dry cardamom fruit is described as due to *Taeniothrips cardamomi* (see above).

Resistance and susceptibility of corn strains to second brood chinch bugs, J. R. Holbert, W. P. Flint, J. H. Bigger, and G. H. Dungan (*Iowa State Col. Jour. Sci., 9* (*1935*), *No. 3, pp. 413–426, figs. 8*).—It is concluded from the work conducted cooperatively by the U. S. D. A. Bureau of Plant Industry, the Illinois State Natural History Survey, and the Illinois Experiment Station that the development and use of strains of corn more resistant to damage from second brood chinch bug infestation is the most logical and feasible method of attacking the problem.

The results thus far obtained "suggest the possibility of producing hybrids that are not only outstanding in yield and quality of grain in years when chinch bugs are not present, but that also possess a high degree of resistance to damage from second brood chinch bug attack, thus making such strains of very great value in years of heavy chinch bug outbreaks."

Notes on the tingid pepper bug Elasmognathus hewitti Dist. [trans. title], J. van der Vecht (*Landbouw* [*Buitenzorg*], *10* (*1935*), *No. 12, pp. 484–493, figs. 2; Eng. abs., pp. 492, 493*).—Injury by the tingid pepper bug *E. hewitti*, which has been recently found on the island of Bangka (Banka), east of Sumatra, is due to feeding on the flowers and perhaps on the very young fruits of the pepper plant. A mixture of tobacco extract, soap, and spiritus or of tobacco and derris extracts has given good results in Borneo.

An annotated list of the Membracidae of Indiana Homoptera), H. O. Deay and G. E. Gould (*Ind. Acad. Sci. Proc., 50* (*1934*), *pp. 236–243*).—This annotated list of tree hoppers includes the localities and dates of collection of 57 forms in the State.

Grape leafhopper control in Kentucky, C. O. Eddy (*Ky. State Hort. Soc. Trans., 1934, pp. 165–168*).—In this contribution from the Kentucky Experiment Station nicotine sulfate, used at the rate of 0.75 pt. per 100 gal. and preferably with a good spreader, is recommended as a means of control of the grape leaf hopper, which has caused severe losses during the last few years in the central and eastern part of the State.

Pubescent and glabrous characters of soybeans as related to resistance to injury by the potato leaf hopper, H. W. Johnson and E. A. Hollowell (*Jour. Agr. Res.* [*U. S.*], *51* (*1935*), *No. 4, pp. 371–381, figs. 5*).—In the studies reported three generations of progenies from a cross between Illini (rough-hairy) and a dominant glabrous soybean were grown at the Arlington Experiment Farm, Rosslyn, Va., in 1931, 1932, and 1933. Each year the glabrous individuals of both the homozygous glabrous and heterozygous progenies were all heavily infested with the potato leaf hopper, were severely stunted in growth, and had curled leaves with yellowed necrotic margins. The rough-hairy individuals, on the other hand, were almost entirely free from the potato leaf hopper, and grew vigorously, and their leaves showed no symptoms of leaf hopper injury.

It would appear that in the soybeans tested resistance was due to the mechanical protection of the rough-hairy pubescence or to some character the inheritance of which is controlled by the same hereditary complex as pubescence. No evidence for the existence of such a character was obtained from these studies, which involved observation of 8,570 glabrous and 6,755 rough-hairy individuals.

Preliminary report on resistance of alfalfa varieties to pea aphids (Illinoia pisi (Kalt.)), R. H. Painter and C. O. Grandfield (*Jour. Amer. Soc. Agron., 27 (1935), No. 8, pp. 671–674, fig. 1*).—Observations of the infestation of alfalfa varieties by pea aphids, made in 86 1/20-acre variety test plats at the agronomy farm of the Kansas Experiment Station in the spring of 1934, are reported upon, the results being tabulated. In a 4-year-old plat of 36 varieties the average percentage of injury varied from 10 for Ladak to 80 for Argentine. In cooperative alfalfa variety tests in McPherson, Lyon, and Shawnee Counties, where Ladak was grown under conditions comparable with commonly grown varieties, this variety was infested and damaged the least in every case. Records kept at the south-central experimental fields near Kingman and Wichita gave additional evidence that the Ladak variety is much less susceptible under a moderate infestation of the pea aphid. A study of the nursery rows, consisting of almost 500 recent importations, has shown the Turkestan group of alfalfas to be the most resistant to pea aphid injury.

Aphid notes, G. F. Knowlton (*Canad. Ent., 67 (1935), No. 9, pp. 190–195*).—This contribution from the Utah Experiment Station presents season, locality, and host records for aphids taken in Utah and nearby States. Under the name *Macrosiphum zerozalphum*, host and locality not recorded, a species near to but different from *M. cornelli* Patch is described as new.

Four western aphids, G. F. Knowlton (*Ann. Ent. Soc. Amer., 28 (1935), No. 2, pp. 281–284, figs. 22*).—Contributing from the Utah Experiment Station, four species of aphids are described as new, namely, *Kakimia ribe-utahensis*, collected from native black currant at Cedar City, Utah; *Macrosiphum harpagorubus*, from blackberry at Puyallup, Wash.; *Capitophorus palmerae*, from *Chrysothamnus nauseosus* at Tahoe National Forest, Calif.; and *Cinara idahoensis*, from evergreen that appeared to be arborvitae at Twin Falls, Idaho.

Development of black cherry aphids on secondary host plants, E. H. Zeck (*Agr. Gaz. N. S. Wales, 46 (1935), No. 6, p. 332*).—This record of the black cherry aphid's developing on cress (*Lepidium sativum*) is said to be the first in Australia and to indicate that migration from the cherry trees to suitable secondary host plants and back again to cherry trees may occur, although as yet no secondary host infested by them has been found in the field.

A variety test of silkworms, P. T. Sun (*China Natl. Agr. Res. Bur. Spec. Pub. 8 (1935), pp. 35, figs. 32; Eng. abs., pp. 11–13*).—A report of the results of the first year's studies conducted by the Chinese National Agricultural Research Bureau.

Codling-moth control experiments of 1934, J. H. Newton (*Colo. State Ent. Circ. 65 (1935), pp. 23, figs. 6*).—Experiments on codling moth control in continuation of those previously noted (E. S. R., 73, p. 652) show that the film type of coverage is more effective than a spot coverage, and that calcium caseinate is effective in forming the film coverage. "It should be used in the minimum amount that will prevent formation of droplets. Larger amounts cause excessive run-off, resulting in a deposit too thin to be effective. The close association that results through the formation of the calcium caseinate in the presence of the lead arsenate and only a small amount of water may explain why the spray deposit and the control were better than in some previous tests wherein the spreader was made separately or by the tank-mix method. The addition of 1 percent summer oil emulsion to lead arsenate improved the control. Nicotine sulfate added to the lead arsenate-oil combination did not materially improve the control. Cryolite (sodium fluoaluminate), when used in the cover sprays, gave control on the Delicious equal to that secured with lead arsenate. The control on Rome Beauty was in some cases superior to that secured with arsenate of lead. A film coverage is more effectively removed by the acid wash than spot coverage. Oil in the spray makes the lead arsenate deposit more difficult to remove. The acid wash cannot be depended on to remove fluorine spray deposits."

Idaho spray program for codling moth control in 1934, C. Wakeland (*Idaho State Hort. Assoc.* [*Proc.*], *39* (*1934*), *pp. 28–34*).—This contribution is accompanied by a table with residue removal data from the Nampa and Fruitland chemical laboratories of the Southern Idaho Shipper's Traffic Association for 1933.

Peach moth investigations in the Goulburn Valley.—Progress report for the season 1934–35, F. J. Gay (*Jour. Dept. Agr. Victoria, 33* (*1935*), *No. 8, pp. 365–369, figs. 3*).—The work of the year, though of a preliminary nature, revealed that both newly hatched oriental fruit moth larvae and codling moth larvae have the habit of rejecting all surface tissue. The small size of newly hatched oriental fruit moth larvae compared with newly hatched codling moth larvae suggests that the efficiency of stomach poisons is influenced by particle size.

Of the various substances tested as ovicides and cover sprays, nicotine sulfate definitely gave the most promising results. The evidence indicates that untreated bandages not only catch large numbers of overwintering oriental fruit moth larvae but also favor the action of native parasites. Native parasites appear to be restricted in their action to the winter months.

The spruce budworm on Michigan pine, S. A. Graham (*Mich. Univ., School Forestry and Conserv. Bul. 6* (*1935*), *pp. 56, pl. 1, figs. 8*).—Studies of the spruce budworm, which since 1923 has been periodically epidemic on pine in the Lake States, are reported upon, a presentation of the budworm situation being followed by accounts of host selection, the building up of budworm outbreaks, the effect of budworm defoliation, the life cycle of the budworm, the relation of infestation to character of trees, defoliation and staminate flowers, the budworm on Scotch pine, the reproductive capacity, the environmental resistance, and budworm control.

It is pointed out that since the budworm feeds on both pistillate flowers and young cones, it may be responsible for a temporary seed shortage in an infested area.

It is concluded that effective control of the budworm depends upon maintenance of dense stands by close planting, filling in undesirable openings, removing susceptible trees in the course of liberation cuttings and thinnings, and the logging of jack pine stands before they become overmature.

The European pine shoot moth, R. B. Friend (*Calif. Dept. Agr. Bul., 24* (*1935*), *No. 3, pp. 322–327, figs. 6*).—A brief practical account contributed from the Connecticut [New Haven] Experiment Station.

The tomato pinworm, R. E. Campbell and J. C. Elmore (*Calif. Dept. Agr. Bul., 24* (*1935*), *No. 3, pp. 301–309, figs. 8*).—This is a practical summary of information on the tomato pinworm, with a list of 11 references to the literature.

Efficiency of banding for the control of cankerworms, A. Hartzell and W. J. Youden (*Contrib. Boyce Thompson Inst., 7* (*1935*), *No. 3, pp. 365–377,* *figs. 3*).—In the experiments conducted, the details of which are given in tables, an attempt to control severe outbreaks of cankerworms (the fall cankerworm and the spring cankerworm) in 1934 and 1935 by banding resulted negatively.

"An evaluation of the efficiency of banding showed a difference of less than 10 percent between the average weights of samples of leaves from banded and unbanded trees. It was demonstrated by means of captures on tanglefoot shields that cankerworm larvae are disseminated by wind. The failure of banding is believed to be due to this factor."

[Contributions on the beet webworm] (*Inst. Zashch. Rast., Trudy Zashch. Rast. (Lenin Acad. Agr. Sci. U. S. S. R., Inst. Plant Protect., Bul. Plant Protect.), Ent., No. 8 (1934), pp. 4–72, figs. 12, Eng. abs. pp. 71, 72; 79–116, fig. 1, Eng. abs. pp. 114–116; 117–135, fig. 1, Eng. abs. p. 133*).—These contributions on the beet webworm, one of the most dangerous enemies of agricultural crops in the U. S. S. R., are as follows: The Distribution of *Loxostege sticticalis* L. in the Western Region of U. S. S. R. and Local Breeding Grounds of the Pest (Ecological and Geographical Study), by A. N. Mel'nichenko (Melnichenko); An Experimental Study of the Influence of Temperature on *Loxostege sticticalis* L., by D. V. Znoĭko (Znojko); and Observations on *Loxostege sticticalis* L. in the South Western Part of the Steppes Adjacent to the Black Sea in 1929–1930, by L. A. Skorkin.

The effect of intermittent starvation upon the development of larvae of the meadow moth Loxostege sticticalis L., J. S. Skoblo (*Bul. Ent. Res., 26 (1935), No. 3, pp. 345–354*).—This is a contribution from the Leshaft Scientific Institute at Leningrad.

It was found that the shorter the periods of feeding and consequently the longer starvation periods during each 24 hr., the stronger their effect upon the length of development of each stage of the beet webworm. "More than 50 percent of larvae fed only for 2 hr. a day and starved for 22 hr. accomplish their complete metamorphosis and produce moths that are fully capable of living. The length of development of each stage depends upon the feeding regime during the previous stage. Using the same starving regime, development of the last stage is the longer the earlier the stage at which larvae were subjected to this regime.

"At different stages of development larvae react differently to the same starvation regime. Thus starving for 12 hr. a day increases the duration of the development of the third stage by 104 percent; that of the fourth stage does not increase at all, while the development of the fifth stage increases only by 31 percent. Nature of food greatly influences the length of development under conditions of intermittent starvation. Starving for 8 hr. a day when feeding larvae on wormwood results in greater increase of development than starving for 12 hr. a day when feeding on goosefoot. All factors influencing the development of the larval phase result in decreasing the weight of the pupae. Decrease in weight of pupae is the greater the longer the starvation periods and the earlier larvae were subjected to starvation effect. Nature of food also highly affects the weight of pupae. Intensity of feeding during feeding periods of starving does not decrease as compared to control. With very strongly starving larvae intensiveness of feeding even increases.

"There is no direct proportion between the quantity of excrement passed, that is, amount of food consumed and the weight of pupae. The longer the development, the more there are feeding periods, and consequently the more excrement passed. Owing to the lengthening of development the most part of substances consumed are spent on vegetative functions; therefore, there cannot exist direct connection between the number of excrement passed and the weight of pupae."

A list of parasites bred from Tortrix and tineid hosts, G. L. Hey (*Ent. Mo. Mag., 3. ser., 21 (1935), No. 248, pp. 186, 187*).—This is a report on the parasites reared from microlepidoptera at the East Malling Research Station.

Light borer occurrence in 1935, W. E. Hinds and B. A. Osterberger (*Sugar Bul., 13 (1935), No. 24, pp. 22, 24*).—Observations of the sugarcane borer by the Louisiana Experiment Station are said to indicate clearly the direct and very effective destruction of borer stages by the very unusual period of cold in December 1934 accompanying and following heavy rainfall. The severe freeze of January 1935, with accompanying heavy rainfall, appears to have been by far the most important climatic control combination occurring during the winter. It is pointed out that these climatic conditions did not have a similar effect in reducing the natural hibernation of the borer egg parasite, *Trichogramma minutum*. The year 1935 was marked by an unusually high percentage of parasitism among borer eggs on corn or cane and the general distribution of this parasitism, in spite of the unusually small number of borer egg batches present.

New records and three new species of American Diatraea (Lep.: Pyral.), H. E. Box (*Bul. Ent. Res., 26 (1935), No. 3, pp. 323–334, pl. 1*).—The author presents information that supplements earlier findings (E. S. R., 65, p. 359), and describes three species of *Diatraea* as new under the names *D. myersi*, from Brazil, and *D. savannarum* and *D. maritima*, both from British Guiana.

The ecological distribution of some South American grass and sugarcane borers (Diatraea spp., Lep., Pyralidae), J. G. Myers (*Bul. Ent. Res., 26 (1935), No. 3, pp. 335–344, pl. 1*).—The survey of the primitive habitats and original host plants of *Diatraea* spp. (E. S. R., 68, p. 638) was extended to cover the interior Guiana plateau, the Rio Branco, the lower Rio Negro, and the lower Amazon. The greatest practical result was the discovery and introduction into British Guiana of the Amazon fly parasite (*Metagonistylum minense*) of the sugarcane borer (E. S. R., 72, p. 510). The 12 species of *Diatraea* considered are grouped as forest, riparian, savannah, and domestic species.

A key to the Nebraska cutworms and armyworms that attack corn, D. B. Whelan (*Nebraska Sta. Res. Bul. 81 (1935), pp. 27, figs. 9*).—Following a brief introduction, descriptions of the head setae and punctures and the body setae and punctures, and a key for the separation of the cutworms and army worms, descriptions are given of 23 that attack corn in the State. Nineteen references are listed.

The role of mosquitoes in the epidemiology of tularemia, I [trans. title], V. N. Fedorov (W. Fedorow) and V. F. Sivolobov (W. Siwolobow) (*Vest. Mikrobiol., Épidemiol. i Parazitol. (Rev. Microbiol., Épidémiol. et Parasitol.), 14 (1935), No. 1, pp. 65–70; Ger. abs., pp. 69, 70*).—The infection of white mice with an emulsion of mosquitoes has shown that the malaria mosquito *Anopheles maculipennis* may preserve virulent *Bacterium tularense* in its body for 50 days or longer.

The biology of some dipterous gall-makers from Texas, R. H. Painter (*Jour. Kans. Ent. Soc., 8 (1935), No. 3, pp. 81–97, figs. 27*).—Notes are presented on 26 species.

A new melon gall midge, E. P. Felt (*Bul. Brooklyn Ent. Soc., 30 (1935), No. 2, pp. 79, 80*).—Under the name of *Itonida citrulli* n. sp. the author describes a gall midge the larvae of which were found by the Arizona Experiment Station to cause the tips of watermelon vines growing in the vicinity of Tucson to curl and die. It is considered a serious enemy of watermelons in that section, its injury having been observed by one grower 9 yr. earlier.

The digestive mechanism of one of the West Indian " eye gnats ", Hippelates pallipes Loew, H. W. KUMM (*Ann. Trop. Med. and Parasitol., 29 (1935), No. 3, pp. 283–302, pls. 2, figs. 3*).—An anatomical and physiological study is reported upon.

The hatching of eggs of the southern buffalo gnat, G. H. BRADLEY (*Science, 82 (1935), No. 2125, pp. 277, 278*).—Studies conducted by the author over a period of several years have shown that the eggs of *Eusimulium pecuarum* will hatch after spending the summer in a quiescent stage, undergoing an incubation period of several months in either still or moving water. This finding is considered to offer an explanation for the fact that, in addition to the numbers of adults which emerge every spring from certain rivers, enormous numbers are produced during spring floods from the many cut-offs, bays, and lakes which are to be found in the lowlands of Mississippi and Arkansas and in which the water is quiet except when adjacent rivers overflow. " Since all *Simulium* larvae, so far as is known, require running water for their development, it appears that the long period which *E. pecuarum* spends in the egg stage is an adaptation for passing the several months during which a large part of its breeding places are likely to be unsuited for larval life. It seems probable that adult gnats are not produced from larvae coming from eggs which hatch in these quiet waters except in the event that a spring overflow occurs and keeps the waters in motion for a period sufficient to permit larval maturity. When such an overflow occurs, myriads of larvae may develop more or less simultaneously and give rise to swarms of adults, which under weather conditions favorable for their survival and migration cause large losses of farm animals."

Studies on the higher Diptera of medical and veterinary importance: A revision of the species of the genus Glossina Wiedemann based on a comparative study of the male and female terminalia, W. S. PATTON (*Ann. Trop. Med. and Parasitol., 29 (1935), No. 3, pp. 303–315, figs. 9*).—A report of studies in continuation of those noted (E. S. R., 73, p. 816).

Experimental studies on the influence of low temperatures upon the development of fruit flies, II–VI, K. KOIDSUMI (*Jour. Soc. Trop. Agr. (Nettai Nôgaku Kwaishi), 4 (1932), No. 3, pp. 322–359, figs. 2, Eng. abs. p. 359; 5 (1933), Nos. 2, pp. 131–154, figs. 8, 3, pp. 317–331; 6 (1934), Nos. 3, pp. 495–504, 4, pp. 687–696, figs. 3*).—These studies, reported in Japanese, are as follows: Part 2, the fatal action of extremely low temperatures upon the pupae and larvae of the melon fly *Chaetodacus cucurbitae* Coq.; part 3, the velocity, favorable temperature, and threshold of development of the pupae, eggs, and larvae of *C. cucurbitae;* part 4, a comparison of the cold-hardiness of *C. cucurbitae* at various stages of its life cycle; part 5, the effect of varying low temperatures upon the emergence of larvae and pupae of *C. cucurbitae;* and part 6, the velocity, favorable temperature, and threshold of development of the eggs, larvae, and pupae of a citrus fruit fly, *C. ferrugineus dorsalis* Hendel.

A revised list of the British Siphonaptera, G. B. THOMPSON (*Ent. Mo. Mag., 3. ser., 21 (1935), No. 248, pp. 181–183*).—Forty-six forms are listed in this revision of the Rothschild list (E. S. R., 33, p. 563).

Notes on Utah Scarabaeidae and Chrysomelidae (Coleoptera), G. F. KNOWLTON and C. F. SMITH (*Ent. News, 46 (1935), No. 9, pp. 241–244*).—A list of the scarabaeid and chrysomelid beetles collected in Utah, together with the locality and collector, contributed from the Utah Experiment Station.

The tiger beetles of South Carolina with the description of a new variety of Tetracha virginica (L.) (Coleoptera: Cicindelidae), O. L. CARTWRIGHT (*Bul. Brooklyn Ent. Soc., 30 (1935), No. 2, pp. 69–78, fig. 1*).—A contribution from the South Carolina Experiment Station in which 27 forms are noted, 1 variety being described as new.

The stag-horn fern beetle, Halticorcus platycerii Lea, N. S. Noble (*Jour. Aust. Inst. Agr. Sci., 1 (1935), No. 3, pp. 115–117, fig. 1*).—A brief account of a leaf beetle which during the last few years has caused considerable damage to staghorn ferns in the Sydney district of Australia.

Spraying trials against the raspberry beetle Byturus tomentosus Fab., R. A. Harper Gray and H. E. Brooks (*Jour. Roy. Hort. Soc., 60 (1935), No. 8, pp. 339–341*).—In the work conducted, the use of derris and barium silicofluoride washes gave the most efficient control of *B. tomentosus*. "The derris fluid spray gave the best control and showed more uniformity in action as compared with liquid barium silicofluoride. A nicotine wash did not give such a good control as either of the above. Two applications of the liquid sprays were sufficient for securing a good practical control—one during the opening of the buds and the other when the petals were falling. Applications consisting of a combination of dusts and a wash gave consistently inferior results. The time of applying the first spray is controlled by the opening of the buds rather than by any special date in June."

Studies in population physiology.—II, Factors regulating initial growth of Tribolium confusum populations, T. Park (*Jour. Expt. Zool., 65 (1933), No. 1, pp. 17–42*).—This second part of a series of contributions previously noted (E. S. R., 67, p. 579; 73, p. 216) is presented with a list of 19 references to the literature. An attempt is made to explain why intermediate-sized populations of the confused flour beetle have grown more rapidly at 11 days than have smaller or larger groups. This was found to be due to the interaction of two factors.

"The first factor was egg eating, or cannibalism. This reduced population growth rate in more crowded cultures since more eggs would be found by random moving beetles and eaten. The factor then favors greatest increase in minimal-sized groups. The second factor was the question of frequency of copulations. It was found that recopulation was stimulating to reproductive productivity, and since more copulations were occurring in concentrated populations this fact favored greatest increase in maximal-sized groups. The interaction of these factors, one favoring maximal growth in small populations and the other favoring maximal growth in large populations, would cause an intermediate-sized population to have greatest initial increase."

The tobacco and solanum weevils of the genus Trichobaris, H. S. Barber (*U. S. Dept. Agr., Misc. Pub. 226 (1935), pp. 28, pl. 1, figs. 3*).—In the study of weevils of the genus *Trichobaris*, of which the most important appears to be the tobacco stalk weevil *T. mucorea* (Lec.) in the southwestern United States, 12 species are dealt with. Of these, 3, *T. major* from Durango City, Mexico, *T. championi* from Cordoba, Veracruz, Mexico, and *T. bridwelli* from South Carolina, Georgia, Alabama, Louisiana, Missouri, Oklahoma, and Texas, are described as new. A list of species, varieties, and synonyms, with type localities, a key to the species, and a list of 15 references to the literature cited are included in the account.

On the Ipidae (Coleoptera) from Formosa, with special references to their food plants, J. Murayama (*Jour. Soc. Trop. Agr. (Nettai Nôgaku Kwaishi), 6 (1934), No. 3, pp. 505–512; Japan. abs., p. 512*).—Notes are presented on 13 forms of Ipidae, including their habitat in Taiwan (Formosa), distribution, trees attacked in Taiwan, and miscellaneous material.

Swarming: Its control and prevention, L. E. Snelgrove (*London: Author, 1935, 2. ed., pp. XI+13–96, figs. 20*).—A description is given of a simple and original method employed by the author in preventing swarming from stocks with advanced queen cells without depriving such stocks of their queens or destroying the queen cells.

Two new species of North American Strumigenys (Formicidae: Hymenoptera), M. R. Smith (*Ann. Ent. Soc. Amer.*, *28* (*1935*), *No. 2*, *pp. 214–216*).—Under the names *S. rohweri* and *S. clypeata brevisetosa* two new ants taken in Mississippi are described.

Two described species of Trichogramma validated, S. E. Flanders (*Pan-Pacific Ent.*, *11* (*1935*), *No. 2*, *p. 79*).—Contributing from the California Citrus Experiment Station, it is pointed out that *T. minutum* Riley may be considered as a synonym of *T. evanescens* Westw., and *T. pretiosa* Riley a synonym of *T. embryophagus* (Htg.).

The biology of Microplectron fuscipennis Zett. (Chalcid.), a parasite of the pine sawfly Diprion sertifer Geoff., K. R. S. Morris and E. Cameron (*Bul. Ent. Res.*, *26* (*1935*), *No. 3*, *pp. 407–418*, *pl. 1*, *figs. 4*).—This report relates to the biology of the parasite *M. fuscipennis* of the pine sawfly *D. sertifer*, cocoons of which, containing nearly 8,000,000 parasites, were collected in Europe in 1934 and dispatched to Canada for the control of the spruce sawfly *D. polytomum* Htg. It is pointed out that the chances of success in Canada depend upon its acclimatization and the accessibility and quantity of host material, the great fecundity and rapid rate of increase being greatly in its favor.

The chalcidoid parasites of lac-insects, C. Ferrière (*Bul. Ent. Res.*, *26* (*1935*), *No. 3*, *pp. 391–406*, *figs. 9*).—A classified list is given of the Hymenoptera known to attack lac insects, together with descriptions of the chalcids listed.

The blue mud-dauber as a predator of the black widow spider, W. G. Irving and E. H. Hinman (*Science*, *82* (*1935*), *No. 2130*, *pp. 395*, *396*).—Observations of the habits of the blue mud dauber wasp (*Chalybion cyaneum* (Klug)) have shown it to be an important predator of the black widow spider (*Latrodectus mactans* Fab.). It was found that in a total of 15 nests examined in New Orleans, La., 285 black widow spiders had been stored as food for the mud dauber larvae, an average of 19 per nest. It was observed that the large yellow-marked mud dauber (*Sceliphron caementarium* (Drury)) rejected the black widow spider as food for its young.

Winter feeding of the tick Dermacentor andersoni Stiles, W. Rowan and J. D. Gregson (*Nature* [*London*], *135* (*1935*), *No. 3417*, *p. 652*, *fig. 1*).—A note on laboratory observations of the feeding habits of adults of the Rocky Mountain spotted fever tick *D. andersoni*.

ANIMAL PRODUCTION

[Experiments with livestock in Georgia] (*Georgia Sta. Rpt. 1935*, *pp. 18–20*, *21*, *23*).—Data obtained in experiments with livestock are reported on protein supplements for swine, roughages for wintering beef cattle, grazing beef cattle, grading up native sheep through the use of purebred rams, the use of soft lard made from peanut-fed hogs, and utilization of pimiento waste by poultry.

[Investigations with livestock in Pennsylvania] (*Pennsylvania Sta. Bul. 320* (*1935*), *pp. 7*, *8*, *15–17*, *27*, *28*).—Data obtained in experiments with livestock are reported on curing pork on the farm, by R. C. Miller and P. T. Ziegler; forage crops for swine, by M. A. McCarty and T. B. Keith; hothouse lamb production, by W. L. Henning; rations for fattening lambs, by Keith; and a comparison of different grades of feeder cattle, by F. L. Bentley and Ziegler.

With poultry information was obtained on vitamin D in eggs, by N. B. Guerrant and J. E. Hunter; the nutrition of turkeys, by Hunter, D. R. Marble, and H. C. Knandel; vitamin D requirements of chickens, by R. R. Murphy, Hunter, and Knandel; breeding poultry resistant to disease, by Marble; a comparison of brooding systems, by E. W. Callenbach and J. E. Nicholas; and the cost of rearing ring-necked pheasants, by Callenbach.

The stability of vitamins B (B_1), G (B_2), and B_4, J. A. Keenan, O. L. Kline, C. A. Elvehjem, and E. B. Hart (*Jour. Nutr., 9 (1935), No. 1, pp. 63–74, fig. 1*).—Using White Leghorn chicks as experimental animals, the Wisconsin Experiment Station (E. S. R., 69, p. 844) made a study of the heat stability of vitamins B, G, and B_4 in a natural grain diet, in a commercial yeast, and in a hog's liver preparation. A study was made also of the separation of these factors by differential heat treatment.

It was found that vitamin B (B_1) in yeast, liver, and in a natural grain ration was completely destroyed by autoclaving. It was inactivated to a great extent in yeast and liver by heating in the fresh state at 100° C. for 24 hr. Vitamin G (B_2) was inactivated in these foodstuffs by a dry heat treatment of 120° maintained for 24 hr. Vitamin B was relatively stable to this thermal treatment. Under these conditions vitamin G did not conform to the conception that it was the more heat-stable factor. Vitamin B_4 was similar in heat stability to vitamin B. This result suggests that much of the past work with vitamin B deficiency may have been due, at least in part, to a deficiency of B_4.

A new toxicant occurring naturally in certain samples of plant foodstuffs, V, VI (*Poultry Sci., 14 (1935), No. 5, pp. 273–279, 280–284, figs. 14*).—These studies at the South Dakota Experiment Station (E. S. R., 74, p. 82) were continued.

V. *Low hatchability due to deformities in chicks*, K. W. Franke and W. C. Tully.—In this phase of the work two lots of 12 doz. eggs and one lot of 4 doz. eggs were obtained from affected farms and incubated in a still-air, hot-water-heated machine according to the usual practice.

Monsters were obtained from the eggs produced by the hens on the affected farms. Approximately 75 percent of the eggs which failed to hatch on the twenty-first day contained deformed embryos. Hatchability in this case was 4 percent of the fertile eggs in one lot and 12 percent in the control.

VI. *A study of the effect of affected grains on growing chicks*, W. C. Tully and K. W. Franke.—In this phase of the study it was found that when chicks were fed a ration containing 65 percent of affected grain, distinctly inhibited growth resulted. With only 25 percent of affected grain, the growth was practically normal. With 65 percent of affected grain, chicks had ruffled feathers and showed noticeable nervousness, and these characteristics were exhibited when the chicks were about 4 weeks old. Egg production was both delayed and reduced by the ration containing 65 percent of affected grain. No distinct lesions of the internal organs were found from gross appearance, as was apparent in the case of the rat.

Commercial feeds in Kentucky in 1934, J. D. Turner, H. D. Spears, W. G. Terrell, and L. V. Amburgey (*Kentucky Sta. Regulat. Ser. Bul. 7 (1935), pp. 32*).—The results of the analyses of 1,175 samples of commercial feeding stuffs, together with definitions and other information as to feeds and their components, are presented (E. S. R., 72, p. 517).

Inspection of commercial feedstuffs, P. H. Smith (*Massachusetts Sta. Control Ser. Bul. 79 (1935), pp. 56*).—This is the usual report of the official chemical and microscopic analyses of 1,651 samples of feeding stuffs intended for livestock and poultry consumption collected for the year ended September 1, 1935 (E. S. R., 73, p. 88).

Inspection of commercial feeding stuffs, 1935, T. O. Smith and H. A. Davis (*New Hampshire Sta. Bul. 285 (1935), pp. 54*).—This is the usual report of the guaranteed and found analyses of 354 brands of feeding stuffs collected for official inspection during the year ended June 1935 (E. S. R., 72, p. 517).

A five-year study of Hampshire show sheep, F. S. Hultz (*Wyoming Sta. Bul. 207* (*1935*), *pp. 60, figs. 24*).—Concluding these studies (E. S. R., 67, p. 726), the measurements and photographs of the yearling and lamb classes of Hampshire sheep at the International Livestock Exposition during the 5 yr., 1930–34, are presented.

The results show that only two of the direct measurements, height at withers and body length, were shared as significant in influencing the judges' decision in all the groups of sheep studied. Only two of the ratios, rear quarter width-loin height and rear quarter width-flank depth, were shared as significant by three of the four classes studied. Four of the measurements, chest width, rear quarter width, twist depth, and heart girth, were apparently shared in importance by only the yearling and ram lambs. In general, the higher ranking individuals in all classes in all years were outstanding both from the standpoints of observation and from the record of measurements. Studies of the wool samples indicated a variation insufficient to result in fleeces being deciding factors in the judges' ranking.

Correlation studies involving the physical characteristics of wool fibers from different breeds of sheep, A. E. Darlow and W. A. Craft (*Oklahoma Sta. Bul. 225* (*1935*), *pp. 20, figs. 2*).—Individual fiber measurements were made on samples of 100 fibers for each of 300 fleeces from Oxford, Southdown, Hampshire, Shropshire, Dorset, and Rambouillet breeds. The measurements made consisted of diameter, length, crimp per unit of length, stretch, and breaking strength.

The coefficients of correlation for diameter and length, diameter and stretch, and diameter and breaking strength were on the whole positive. These relationships indicated that within the breed the larger fibers tended to be longer, more elastic, and stronger than the smaller fibers. The coefficients between diameter and crimp were largely negative, indicating that the smaller fibers tend to crimp more frequently than the larger fibers.

On the basis of fineness of fibers the breeds ranked with means as follows: Rambouillet 6.56, Southdown 8.86, Shropshire 9.23, Hampshire 9.31, Dorset 10.79, and Oxford 10.91 ten-thousandths of an inch. The difference between the means for the Dorset and Oxford and for the Hampshire and Shropshire was insignificant. The mean fiber lengths were for the Oxford 107.03, Dorset 94.12, Shropshire 87.33, Hampshire 79.76, Rambouillet 63.6, and Southdown 63.17 mm. The difference between the means for the Rambouillet and the Southdown was insignificant. The mean frequency of crimp per inch was Rambouillet 14.05, Southdown 9.7, Shropshire 8.6, Hampshire 7.86, Dorset 6.79, and Oxford 6.46. The difference between the means for the Oxford and Dorset was insignificant. These relationships indicate that crimp and length should be two very useful observations in flock selection for fleece improvement.

It is concluded that where breeders of mutton sheep have average flocks they can afford to give more attention to the crimp, fineness, and length of fleece of their sheep. Breeders of fine-wool sheep whose flocks resemble the Rambouillets in this study can afford to give more attention to length of fiber and also to a high count of crimp. Selection based on length alone should result in coarser wool with a decrease in the frequency of crimps.

The pre-natal development of the coat of the New Zealand Romney lamb, N. Galpin (*Jour. Agr. Sci.* [*England*], *25* (*1935*), *No. 3, pp. 344–360, figs. 10*).—A study of the development of the coat of the sheep with a view to interpreting postnatal morphological expressions from prenatal events was undertaken at the Massey Agricultural College, New Zealand. The material used consisted of a series of dated New Zealand Romney fetuses from the college flock and a number of undated ones from various sources. The skin was divided into six areas, each division being formed by the grouping of all regions that developed the coat at the same time and rate.

The study showed that the different areas developed at different times and that there was an orderly progression in development from one area to another. There were certain marked stages during development that made it possible to judge the approximate age of the fetuses by a study of the different stages of follicle development occurring over the fetus at the same time. Each region was a local governor of its own development. The first follicles formed were the first from which fibers pierced the skin. Certain areas were always in advance of other areas in the order of developmental progress. The time elapsing between the foundation of a follicle and a fiber piercing the skin was between 6 and 7 weeks.

The first fibers to appear were on areas carrying sensory hairs. The next regions were those around the horns and posterior coronets, while the last areas on which the fibers appeared were over the back and rump. The particular variety of fibers produced from these first follicles depended upon the prenatal check. In the Romney on all areas except the face, neck, and withers the first fibers were often halo-hairs, but on fine-wooled breeds they were usually sickle fibers. The latter fibers continued emerging from the skin, and what they became depended upon the time and extent of the reducing of inherent coarseness.

Swine feeding investigations, 1934–35, C. E. Aubel and W. E. Connell (*Kansas Sta., 1935, pp. 6*).—A series of three experiments is reported in mimeographed form.

Winter, 1935.—In this test four lots of pigs were fed a basal ration of shelled corn for 120 days in dry lot. In addition, the respective lots received the following protein supplements: Tankage and alfalfa hay; meat scrap and alfalfa hay; tankage, linseed meal, and alfalfa meal 2:1:1; and meat scrap, linseed meal, and alfalfa meal 2:1:1. The average daily gains in the respective lots were 1.4, 1.3, 1.5, and 1.4 lb. per head. The results showed that tankage either alone or as a part of a mixture was somewhat more efficient in producing gains than meat scrap. The animals fed tankage in dry lot gained more efficiently than those fed meat scrap.

Summer, 1935.—For this test four lots of pigs were fed on alfalfa pasture for 120 days. Lots 1 and 2 received shelled corn and lots 3 and 4 soaked shelled corn. The protein supplements fed in the respective lots were tankage, meat scrap, tankage, and semisolid buttermilk. The average daily gains in the respective lots were 1.5, 1.4, 1.6, and 1.2 lb. per head.

As a protein supplement to corn on alfalfa pasture, tankage and meat scrap were approximately equal. Soaked corn produced larger but not as economical gains as shelled corn. The ration of soaked corn and semisolid buttermilk proved to be an inefficient one from the standpoint of both rate and economy of gain.

Summer, 1935.—In this test three lots of pigs were fed for 120 days on a basal ration of shelled corn and tankage. Lot 1 was on alfalfa pasture, lot 2 was fed alfalfa hay in dry lot, and lot 3 received fresh-cut green alfalfa three times per week. The average daily gains in the respective lots were 1.5, 1.4, and 1.3 lb. per head.

The pigs in lot 1 made the largest and most economical gains. The dry-lot pigs consumed almost twice as much tankage per unit of gain as those on pasture. Lot 3 made smaller gains than lot 2, but the cost of gains in these lots was practically identical.

Soybean pasture for fattening hogs, B. E. CARMICHAEL (*Maryland Sta. Bul. 376 (1935), pp. 299–311*).—For this experiment five lots of 10 pigs each were fed for 84 days. The check lot was fed in dry lot on a self-fed ration of corn, tankage, and minerals. The remaining lots were on soybean forage. Lots 2 and 3 received a light corn ration for 56 days and were then full fed, while lots 4 and 5 were self-fed corn during the entire period. Tankage was fed in lots 2 and 4, but the amount in lot 2 was limited to 0.2 lb. per head daily. All lots were self-fed minerals. The average daily gains were 1.5, 1.2, 1.1, 1.7, and 1.2 lb. per head in the respective groups. Adding soybean forage to a self-fed ration of corn, tankage, and minerals resulted in a 9.1 percent greater gain in weight, a 31.1 percent smaller consumption of tankage, a 2.4 percent greater consumption of feed aside from forage, and a 6.2 percent smaller amount of feed per unit of gain. Adding self-fed tankage to a self-fed ration of corn and minerals, when both lots had access to soybean pasture, resulted in a 34.3 percent greater gain in weight, a 54 percent reduction in mineral consumption, a 28.3 percent greater consumption of feed aside from pasture, a smaller consumption of forage, and a 4.5 percent reduction in feed required per unit of gain.

Limiting the corn during the first 56 days decreased the total gain 30 percent when tankage was fed to both lots and 9.6 when no tankage was fed. Soybean forage was not an adequate single supplement to corn and minerals. Substituting 0.2 lb. of tankage per head per day for a part of the shelled corn fed to light-fed pigs on pasture resulted in a 4 percent greater gain in weight, a 16.9 percent reduction in amount of minerals consumed, and a 3.4 percent reduction in feed required per unit of gain. Lots receiving no tankage did more rooting than was done by the lots which received silage. It is concluded that market conditions should be taken into account in deciding which combination of feeds should be used.

The effect of full versus limited feeding on the protein level required in the hog ration, E. W. CRAMPTON (*Sci. Agr., 15 (1935), No. 7, pp. 463–475; Fr. abs., p. 473*).—This study at Macdonald College, Canada, was undertaken to determine the effects on rate of gain and on type of hog and carcass produced by different levels of protein in the diet when full fed as compared with limited feeding. Five lots of pigs were used. During the first 30 days after weaning the pigs in lot 1 received a ration containing 20 percent of crude protein. This quantity was reduced to 17 percent during the second 30 days and to 14 percent during the remainder of the feeding. The percentage of crude protein in the other lots for the same periods was 20, 14, 14; 17, 17, 14; 17, 14, 14; and 14, 14, 14, respectively. Half of the pigs in each lot were full fed, and the remainder were half fed the amount eaten by the first group.

The results showed that with the feed mixture used the rations for market pigs need not contain more than 17 percent total crude protein regardless of whether the pigs are full fed or half fed for the first 30 days after weaning. For the next 30 days the protein level of full-fed pigs may be reduced to 14 percent, but there was some evidence to show that with half feeding pasture gains and slightly greater feed efficiency may be expected if the protein level at weaning is continued. After 60 days the lot that was started at weaning on 17 percent protein and changed after 30 days to 14 percent protein continued to show equally efficient and the fastest gains of any of the lots.

For the whole period lot 4 of the full-fed and lot 3 of the half-fed lots gave the best results. The ration containing 14 percent protein for weanling pigs did not permit optimum growth. The method of feeding did not affect the efficiency of gains, but full feeding resulted in 60 percent faster gains. When marketed at about 200 lb. live weight, full feeding did not adversely affect the market grade either on the hoof or in the carcass.

The retention of protein by growing pigs, J. H. W. T. Reimers and L. H. Bartel (*Jour. Agr. Sci.* [*England*], *25* (*1935*), *No. 3, pp. 397–418*).—This paper presents the results of experiments at the University of Stellenbosch, Union of South Africa, on the minimum, optimum, and maximum amounts of protein for normal growth. A series of three experiments was conducted with Large Black × Tamworth crosses and with purebred Tamworth swine.

From the figures for retention of protein and from the increases in live weight when different amounts of starch units were fed, it is concluded that increases in weight alone did not create an accurate basis on which to formulate feeding standards for growing pigs. A lack of nonnitrogenous substances in the ration reflected itself not only in a low total gain in live weight, but often in a low retention of the protein of the ration. A certain proportion of protein to total energy for growing animals was necessary for normal development. When the retention of daily digested protein reached 60 to 70 percent it was improbable that an increase in the amount of protein or amount of energy could improve this retention percentage. When more protein was given than could be physiologically absorbed at a rate of 60 to 70 percent retention, this percentage fell and a superfluous consumption of protein set in.

These studies indicated that the maximum amount of protein a normal growing animal was able to retain daily lay between ±120 and 150 g for pigs weighing from 40 to 50 kg, between ±140 and 170 g for pigs of 50 to 60 kg, and could be increased to ±160 to 200 g per day for pigs weighing 60 to 70 g, provided the daily increase in live weight of these pigs varied between 550 and 650 g during a period of 3 to 4 weeks.

The amount of total energy necessary to obtain growth was estimated from the calculations of the starch equivalent of the various rations. It was calculated that for normal increase in weight of pigs weighing about 40 kg 1.2 s. e. (starch equivalent) was sufficient, for pigs between 40 and 50 kg at least 1.5 s. e., and for pigs of 50 to 60 kg up to 1.8 s. e. For pigs heavier than 60 kg about 2.2 s. e. per day seemed necessary. It is indicated that the pigs used in this work were of a late-maturing type and not capable of making as large gains when young as quicker maturing animals. If this condition were true, the comparisons with the results of other investigators would indicate that instead of the amounts of protein fed being too small, the amounts of starch equivalent used in these experiments were too large.

The effect of the growth-promoting, appetite-stimulating, or "physin" factor on the live-weight increase of swine, G. Dunlop (*Jour. Agr. Sci.* [*England*], *25* (*1935*), *No. 3, pp. 445–459*).—In studies at the Animal Nutrition Research Institute, a growth-promoting or appetite-stimulating factor, physin (Mapson) (E. S. R., 68, p. 860), which was shown to give rise to an accelerated growth rate in laboratory animals, produced a similar marked effect in hogs when added to an adequate diet of natural feeding stuffs. The increased response was approximately 40 percent. Physin acts through stimulating appetite and general growth and does not enhance the net energy value of the ration. Feeding stuffs that may be used to supplement the diet of domestic animals may be arranged in relation to their physin content from the highest to the lowest order as follows—liver, liver meal, dried whole milk, whey, green feed, fishmeal, and meat meal or extracted soybean meal.

Effect of grinding on digestibility of Argentine flint corn, J. C. Fritz (*Poultry Sci.*, *14* (*1935*), *No. 5, pp. 267–272*).—The digestibility of whole, cracked, and finely ground Argentine flint corn was studied by the U. S. D. A. Bureau of Animal Industry, using Rhode Island Red cocks which were surgically altered so that the urine and feces were voided separately. Coefficients of apparent digestibility were determined for total dry matter, organic matter, crude and true protein, ash, ether extract, crude fiber, and nitrogen-free extract.

Grinding did not change the apparent digestibility except in the cases of organic matter, ash, and ether extract. The difference in digestibility of the organic matter was caused by the ether extract portion, and without the ether extract the digestibility of the organic matter was not significantly influenced. Coarse cracking increased the digestibility of ether extract to near its maximum digestibility, while fine grinding was required to improve the utilization of ash. In general, grinding Argentine corn resulted in a slight but probably not significant increase in digestibility. This corn had essentially the same digestibility as dent corn.

The utilization of nitrogen, calcium, and phosphorus by the growing chick, C. W. Ackerson, M. J. Blish, and F. E. Mussehl (*Nebraska Sta. Res. Bul. 80 (1935), pp. 16, fig. 1*).—This study was undertaken to determine the actual gain of nutrients by chicks during a feeding trial in which the amount of food ingested was accurately known. In the initial work 127 newly hatched chicks were killed, individually weighed, and disintegrated with hydrochloric acid so that determinations could be made on aliquots of the resulting solution. In the latter work chicks were force fed for from 3 to 4 weeks on definite amounts of known rations. The chicks were weighed semiweekly and at the end of the test were killed and analyzed after the intestinal contents were removed.

The comparative slaughter tests showed the retention of nitrogen to be 37.8 percent, of calcium 43.4 percent, and of phosphorus 27.3 percent of the respective elements fed. The average gain in live weight per gram of nitrogen fed was 12 g. The rate of gain was 41.5 percent of the dry matter fed. The coefficient of variability was approximately 5 percent, except for the calcium, which had a coefficient of 8 percent.

This study showed that the forced feeding of pellet rations permits accurate control of the food intake of baby chicks. This method of feeding also permits the estimation of the percentage retention of nitrogen, calcium, and phosphorus with a low coefficient of variability. The percentage rate of gain and the gain per gram of nitrogen fed approached constant values regardless of differences of 500 g in gains during a 60-day feeding period. No significant sex differences in nutrient utilization were observed.

Studies in the nutrition of the chick.—II, Effect of purification of casein in simplified diet, R. van der Hoorn, H. D. Branion, and W. R. Graham, Jr. (*Poultry Sci., 14 (1935), No. 5, pp. 285-290, fig. 1*).—Continuing this study (E. S. R., 72, p. 236), the presence of a strong growth-promoting factor for chicks in crude casein was demonstrated. This factor could be examined with dilute acetic acid.

A new leg deformity, tentatively called "arthritis", followed the substitution of purified casein for crude casein in the synthetic diet. Evidence is presented to show that the growth-promoting factor and the arthritis-preventing factor, although both are removed during the purification of the casein, are separate factors, the latter being a mineral.

Miscellaneous studies on poultry grit, R. H. Waite (*Maryland Sta. Bul. 377 (1935), pp. 313-335, figs. 6*).—Continuing a previous experiment (E. S. R., 47, p. 73), evidence is presented to show that limestone of low magnesium content will adequately supply all the calcium needed for eggshell formation, and also give whatever additional service grit may render in the digestive process. Crushed oyster shell can also serve these purposes. Hens appeared to have little difficulty in disposing of any excess of limestone, oyster shell, or other grit consumed. There was probably less disturbance to the digestive functions when calcium was furnished in grit or granular rather than in powdered form. Hens were inclined to eat more than they needed of oyster shell and to excrete the excess. Hens appeared to be able to retain hard grit, such as quartz particles, over long periods of time. Over a 6-yr. period the average consumption of crushed oyster shell per bird per year was 3 lb., of limestone grit 0.7, and of granulated bone 0.4 lb.

Chicks raised without grit made better than normal growth. When grit was fed to young chicks insoluble grit appeared to be the most desirable. In the gizzard of a laying hen limestone dissolved in about 48 hr. One type of granite grit disappeared rapidly in the gizzard, due to a shattering action. Oyster shell did not dissolve in the gizzard as rapidly as limestone. No significant results were obtained in a comparison of limestone and granite grit. In tests of hardness with a "mechanical gizzard" a pebble grit ranked first. A sample of blue limestone was the hardest of the quarried materials tested. Granite grits and crystalline limestone grits had a tendency to shatter under pressure, and the granite grit from Georgia was the "softest" of the grits tested.

Effect of X-rays on the incubation period, sexual development, and egg-laying in White and Brown Leghorn chickens, J. M. Essenberg (*Poultry Sci., 14 (1935), No. 5, pp. 284, 293, 317*).—For this study more than 600 White and Brown Leghorn chicken eggs were X-rayed with dosages varying from 30 to 600 r (roentgen rays) and with incubation ages ranging from 19 to 243 hr. The viable chicks were raised to maturity and observed during their first 3 yr. of life.

The incubation period in X-rayed eggs varied with the dosage used. In small dosages, less than 80 r, there was acceleration, and in dosages of more than 80 r there was retardation in the developmental process. Sexual development was accelerated in both sexes by X-ray treatment. The egg production of treated birds was materially reduced.

Two methods of estimating the mean percentage of thick white for the first year egg production, C. W. Knox and A. B. Godfrey (*Poultry Sci., 14 (1935), No. 5, pp. 290, 319*).—In order to determine a reliable method for estimating the mean percentage of thick albumin in the eggs of a pullet's first-year egg production, the U. S. D. A. Bureau of Animal Industry studied two methods. One method consisted of comparing the mean percentage of thick albumin in eggs laid on Tuesday and Thursday of each week throughout the year with the yearly mean percentage of thick albumin for the first year's egg production. The second method consisted of comparing the mean percentage of thick albumin of the eggs laid during March with the yearly mean percentage of thick albumin. Both methods were tried with the eggs laid by 25 Rhode Island Reds.

There was practically no difference between the group means of the percentage of thick white. The individual differences from the yearly mean of each hen and the standard deviations of the differences were greater for the eggs laid in March, hence the method where eggs were examined two days a week is preferred when individual means were compared.

Identification of the non-layer, J. C. Taylor (*New Jersey Stas. Hints to Poultrymen, 22 (1935), No. 5, pp. 4, fig. 1*).—The characteristics of laying and nonlaying hens are described for use in eliminating the nonlaying birds from the flock.

Effect of age on reproduction of the turkey hen, V. S. Asmundson and W. E. Lloyd (*Poultry Sci., 14 (1935), No. 5, pp. 259–266, fig. 1*).—The California Experiment Station reports the results of a study on the effect of age on the egg production of Bronze turkey females during the period 1927–33, inclusive.

Egg production decreased from 76.6 eggs in the first laying year to 49.5 eggs in the second laying year. Production further decreased to 44 eggs for the third and fourth years and to 27.6 eggs for the fifth year. The date of first egg and rate of production changed but little from the second to the fourth year. When birds with complete 3-yr. records were compared, it was found that the percentage decrease in egg production and the rate of production were about the same from the first to the second year as from the second to the third year, but the length of the laying year decreased more from the first to the second year than from the second to the third year.

Fertility of eggs did not change significantly with age, but hatchability of fertile eggs decreased after the second year. The eggs laid were larger in the second year than in the first laying year. Poults from 2-year-old hens were larger also at time of hatching than those from yearling hens, but at 16 weeks of age there was no significant difference in weight of birds. It is concluded that the older the breeding hens the fewer were the progeny obtained and raised.

Influence of incubation temperature on the hatchability of eggs, postnatal growth, and survival of turkeys, A. L. Romanoff (*Jour. Agr. Sci.* [*England*], *25* (*1935*), *No. 3, pp. 318–325, figs. 4*).—The [New York] Cornell Experiment Station made a study of the influence of temperature during the latter part of incubation on the hatchability of turkey eggs and on the early development of hatched poults. Eggs were exposed during the above period to temperatures (uniform around the eggs) ranging from 30.5° to 41.5° C. in intervals of 1°.

Hatchability was best at temperatures ranging from 36° to 38°, and then declined with a greater slope toward high than toward low temperatures. The time of hatching was progressively delayed from 1 to 3 days toward high and low temperatures. The weight of poults at hatching time was fairly uniform regardless of the temperatures. The number of crippled poults at hatching progressively increased with decrease of temperature below normal. Poults hatched at temperatures of 36.5° to 37.5° showed good growth and high viability in the 3-week period of postnatal development, while birds hatched at 34.5°, 35.5°, 38.5°, and 39.5° showed poor growth and high mortality during the first week of brooding, and birds hatched at 31.5°, 32.5°, 33.5°, and 40.5° were marked by an absence of growth and invariably early death.

Cottonseed hulls for nesting material, B. W. Heywang (*Poultry Sci., 14* (*1935*), *No. 5, p. 279*).—A comparison was made at the U. S. D. A. Southwest Poultry Experiment Station, Glendale, Ariz., to determine the hatchability of eggs laid on nesting materials of either cottonseed hulls or straw. Eggs were also incubated in an electric incubator and under hens in nests made of hulls. The results showed that the use of cottonseed hulls as a nesting material did not lower the hatchability of eggs laid or incubated in the nests.

The z-test in covariance analysis, H. W. Titus (*Poultry Sci., 14* (*1935*), *No. 5, pp. 291–293*).—Continuing this series (E. S. R., 73, p. 366) by the U. S. D. A. Bureau of Animal Industry, this paper was prepared to demonstrate "(1) the computation of corrections to be subtracted from the adjusted mean squares of the dependent variate so that the z-test will be applicable, and (2) the computation of 'reduced' means squares of the dependent variate to which the z-test is directly applicable."

DAIRY FARMING—DAIRYING

[Investigations with dairy cattle and dairy products in Pennsylvania] (*Pennsylvania Sta. Bul. 320* (*1935*), *pp. 7, 21–23, fig. 1*).—Investigations with dairy cattle resulted in data on a comparison of dehydrated and sun-cured alfalfa hay, by S. I. Bechdel and P. S. Williams; and pasture fertilization, by F. D. Gardner, Bechdel, and C. F. Noll.

In studies with dairy products information was obtained on vitamins in milk from different breeds of cattle, by R. A. Dutcher, N. B. Guerrant, and Bechdel; tallowy flavor in milk, and plastic cream as a source of fat in ice cream, both by C. D. Dahle; freezing milk and cream, by F. J. Doan and F. B. Baldwin; bound water in dairy products, by Dahle and H. Pyenson; properties of a bacterial-inhibitory substance produced by a mold related to *Penicillium notatum*, by R. D. Reid; and the heat stability of evaporated milk made from hard-curd milk, soft-curd milk, and milk from mastitis-infected udders, by R. C. Welch and Doan.

Tankage as a source of protein for dairy cows, J. G. Archibald (*Massachusetts Sta. Bul. 321* (*1935*), *pp. 8*).—In order to determine the value of tankage for milk production two groups of 12 cows each were fed by the double reversal method on the same basal ration. One group received a grain mixture in which tankage was the chief source of protein, while the other lot received the same mixture but with equal parts of soybean meal and cottonseed meal replacing the tankage. These supplements were fed in such quantities that both groups received the same amount of digestible protein.

No difficulties were experienced in getting the cows to eat the tankage ration. There were no significant differences between the two lots in the gain in weight, general appearance, milk production, composition and flavor of the milk, or whipping quality of the cream. It is concluded that high-grade tankage can be safely used for feeding dairy cattle. In addition to its protein content, tankage contains considerable bone which may be valuable as a source of minerals.

Potatoes versus swedes in the ration of dairy cows, P. Conroy ([*Irish Free State*] *Dept. Agr. Jour.*, *33* (*1935*), *No. 1*, *pp. 101–105*).—In this demonstration, conducted in County Westmeath with 2 lots of 6 cows each, it was found that potatoes could be used to advantage to replace swedes in the ration of dairy cows when substituted at the rate of 1 part of potatoes for 2 parts of swedes.

Grass silage, J. P. Drew, G. F. O'Sullivan, and D. Deasy ([*Irish Free State*] *Dept. Agr. Jour.*, *33* (*1935*), *No. 1*, *pp. 1–22*, *pls. 2*).—In studies at University College it was found that grass silage of excellent quality could be produced in an inexpensive concrete silo from unchaffed material. Grass containing a high proportion of stemmy material was not as suitable as that of a more leafy type, especially when silage was made by the acid method, owing to the difficulty of close packing. Under existing conditions small wooden silos were not suitable for silage production, even by acid methods.

The production of silage by acid treatments required a great deal more labor and delay than was incurred in the making of natural fermentation silage. The addition of acids or of acids and sugar to grass resulted in a reduction in the loss of dry matter. The acidification of green material produced a medium suitable for mold development during the period of storage and emptying of the silo, and molds often developed to such an extent as to offset the saving in dry matter effected by the addition of acid. While the addition of acids or acids and sugars did not entirely prevent protein degradation, it materially reduced the extent to which it took place. For dairy cows grass silage produced by acid methods was about equal in feeding value to that produced by natural fermentation. The natural fermentation method is considered to be the most convenient, reliable, and economical for general adoption when grass can be cut at a stage of growth where it is possible to handle it by ordinary farm machinery.

Dairy cow testing throughout the world, A. Brizi (*Roma: Inst. Internatl. Agr., 1935, pp. XI+168, fig. 1*).—This monograph was prepared to give a general idea of the systems of milk recording followed in the different parts of the world and to assist in arriving at a fair estimation of the value of the numerical data provided by the milk-recording scheme in the various countries (E. S. R., 54, p. 571).

The use of cleaners in the dairy plant, H. J. Barnum, P. S. Lucas, and B. Hartsuch (*Michigan Sta. Spec. Bul. 262 (1935), pp. 24, figs. 2*).—These studies were undertaken to determine the properties and efficiency for specific purposes of various dairy cleaners. The cleaners studied were divided into the following classes—modified or neutral sodas, soda ash, special alkalies, trisodium phosphate, and colloidal. Aside from the trisodium phosphate, the cleaners were similar in composition.

While all of the cleaners were sufficiently soluble as ordinarily used, soda ash was the most soluble, followed by modified sodas, special alkalies, trisodium phosphate, and colloidal. Some of the cleaners were highly buffered and resistant to reduction in cleansing ability. In most cases tap water retarded this action more than distilled water. The modified sodas were most stable in buffer action, followed by soda ash and colloidal, special alkalies, and trisodium phosphate. In causticity the special alkalies were highest, trisodium phosphate second, soda ash and colloidal about equal, and modified sodas lowest. For removing butterfat from a utensil by emulsification the special alkalies were most efficient, but could not be used for hand-washing because of their caustic action. Soda ash and colloidal were second in efficiency in this respect, followed by modified sodas and trisodium phosphate. Soda ash was the most efficient water softener, followed in order by colloidal, modified sodas, special alkalies, and trisodium phosphate.

Cleaners containing abrasives are commonly called "detergents." Aluminum and copper were very severely scratched by the volcanic ash content of such cleaners, while tinned copper and tinned steel were severely scratched, nickel moderately scratched, and Ascoloy and chrome nickel steel were unaffected. Special alkalies were very severe in their corrosive action on metals, trisodium phosphate was second in severity, soda ash third, and colloidal and modified sodas were least destructive. Tinned steel was most subject to corrosion, aluminum second, followed by tinned copper and copper. Nickel was but slightly affected by corrosion, and Ascoloy and chrome nickel steel appeared to be entirely resistant. While many of the cleaners had distinct disadvantages for use on metals, these objections may not hold for glassware washing.

Measurements of the distribution of the different sized fat globules in milk and buttermilk [trans. title], H. A. Sirks (*Dept. Econ. Zaken [Netherlands], Verslag. Landbouwk. Onderzoek., No. 41 C (1935), pp. 28; Eng. abs., pp. 27, 28*).—A study was made at the Agricultural Experiment Station, Hoorn, to determine how the quantity of microscopically visible fat in buttermilk agreed with the percentage of fat as determined by the Gerber method. In examining each group of milks the number of fat globules, in accurately known volumes, of each class of the group was determined. From these numbers the quantity of fat contributed by each class to the quantity of Gerber fat contained in the quantity of buttermilk examined was calculated in percentages. Examination was extended to the 80μ fat globules, and attention was given to the aggregates and small lumps of butter.

The results showed that in whole milk the sum of the percentages contributed by the different classes of fat globules to the total quantity of fat differed little from 100 percent. With buttermilk, however, the sum remained far below the 100 percent of the fat found by the Gerber method. It is concluded that a considerable part of the Gerber fat contained in buttermilk occurred in a form which was not visible through the microscope.

A study of the lecithin content of milk and its products, B. E. Horrall (*Indiana Sta. Bul. 401* (*1935*), *pp. 31*).—This study was undertaken to determine the lecithin content of milk and its derived products. The Mojonnier modification of the Roese-Gottlieb method was used to extract the organic phosphorus along with the fat from dairy products. A modification of the colorimetric method of Deniges was found to be accurate for determining the organic phosphorus in dairy products. The lecithin content was calculated by multiplying the phosphorus content by 25.94.

The milk of three dairy cows had fat that contained a fairly constant percentage of lecithin after the fourth day of lactation. Colostrum milk fat contained a higher percentage of lecithin than the fat of later milk. Mixed milk contained a higher percentage of lecithin than did that of fat from milk from normal individual cows. Mastitis caused an increase in the percentage of lecithin in the fat of milk.

The lecithin content of skim milk averaged 13.9 percent of the fat, of raw sweet cream 0.428 percent, of raw sour cream 0.422 percent, of pasteurized sweet cream butter 0.232 percent, and of pasteurized neutralized sour cream 0.17 percent. Buttermilk from pasteurized sweet cream contained an average of 19.66 percent lecithin in the fat, while pasteurized neutralized raw cream averaged 17.88 percent. Separator slime contained 12.38 percent lecithin in the fat. In one trial the lecithin content in the butter made from sour cream decreased materially over a storage period of 24 days, while that of sweet cream butter remained practically constant.

The fat of hens' eggs contained on the average 26.64 percent lecithin. A method for determining the amount of eggs in ice cream mix based on lecithin content is given.

Flavors of milk and their control, C. L. Roadhouse and J. L. Henderson (*California Sta. Bul. 595* (*1935*), *pp. 30*).—Continuing these investigations (E. S. R., 68, p. 808), it has been established that certain feeds, when consumed by cows during the 5-hr. period before milking, imparted to milk a flavor that varied in intensity according to the kind of feed, the quantity consumed, and the length of time between feeding and milking. Some feeds caused a distinct feed flavor that could be detected while the milk was being drunk. In other samples the feed flavor was not observed during drinking, but after the milk was swallowed an after-flavor was detectable.

Full rations of alfalfa hay, green alfalfa, clover hay, or corn silage fed 1 to 2 hr. before milking produced certain undesirable feed flavors and odors. Smaller quantities of these roughages fed during the same interval also imparted a distinct and undesirable feed flavor. Green barley, wild oats, foxtail, and alfilaria when fed to cows 2 hr. before milking as the sole source of roughage and in quantities required for satisfactory nutrition imparted undesirable feed flavors varying from slight to strong. The juice expressed from 25 lb. of green alfalfa when administered as a drench produced a feed flavor that was detectable in the milk 20 min. later. This flavor was most prominent in the milk drawn 45 min. after the juice was administered and then gradually decreased. Tame oat hay gave only a slight after-flavor to milk when fed at the rate of 8 to 9 lb. 2 hr. before milking. Improperly cured hay with a musty odor transmitted a musty flavor to milk.

Rolled barley, coconut meal, soybean meal, cottonseed meal, wheat bran, and dried beet pulp when fed 1 to 2 hr. before milking did not give milk sufficient flavor to make it undesirable. Wheat bran when fed at the rate of 5.5 to 7 lb. 1 hr. before milking appeared to improve the flavor of milk.

A salty taste was observed in milk from certain cows that were advanced in lactation and also from one or more quarters of udders previously affected with mastitis. Rancid milk was produced by certain cows that had been milking for longer than the usual lactation period. This off-flavor was due to the enzyme lipase present in the milk at the time it was drawn. Pasteurization destroyed the activity of the lipase and prevented the development of rancidity. Oxidized flavors developed in milk that had been in contact with certain corrodable metals or exposed to sunlight.

Rapid acid tests for cream, E. W. Bird and D. F. Breazeale (*Iowa Sta. Bul. 334* (*1935*), *pp. 233–248*).—Rapid acidity tests for cream employing (1) sodium carbonate, (2) saturated lime, (3) sodium hydroxide, and (4) Farrington solution are described. The precautions to be observed with these tests and the conditions that must be observed in grading cream at 0.2, 0.4, and 0.6 percent acidities with these methods are discussed. The errors involved through the use of a quart milk bottle as a container in which to prepare the solution were shown to be unimportant. Exposure to air decreased the concentrations of solutions, especially the sodium carbonate and the Farrington solutions. For this reason, it is advised that all test solutions be kept tightly stoppered when not in use. The peculiar behavior of the Farrington solution, which graded at 0.4 and 0.6 percent cream samples that had acidities from 0.465 to 0.485 and from 0.7 to 0.71, respectively, was shown to result from too great a concentration of alkali and too little phenolphthalein in the tablets.

Testing cream and butter for extraneous matter, R. P. Myers and R. Whitaker (*Amer. Creamery and Poultry Prod. Rev.*, *79* (*1935*), *No. 15*, *pp. 502–506*, *fig. 1*).—Since the present method of sediment test has not proved entirely practical for the routine grading of cream and for plant control of the manufacture of butter, these studies were undertaken to obtain more information on the essential factors involved in making the tests.

It was found that N/20 hydrochloric acid or N/20 sulfuric acid solutions were more satisfactory than the 4 percent borax solution now used, since the filter plugs less frequently. Sulfuric acid was the more convenient because of its common usage in creameries. Somewhat less sulfuric acid solution was necessary in making the test than borax solution. Of the filtering materials studied, nainsook cloth proved to be more reliable than lintine (cotton pad) or filter paper. Nainsook cloth with a mesh of 100×100 with an average strand size of about 0.006 in. seemed to be the most satisfactory. A filtering area of 1.8 sq. in. appeared to be optimum, as a smaller area sometimes filtered too slowly and a larger area made the examination less convenient since the sediment was less compact. None of the six commercial sediment testers included in the study were found to be entirely satisfactory. For permanent mounting of the filter disks the following methods were proposed—(1) mounting the moist disks or squares on cards and enclosing the same in Cellophane envelopes, and (2) mounting the wet disks on small squares of window glass.

The use of plastic cream in making whipping cream, C. D. Dahle, R. C. Welch, and A. O. Shaw (*Milk Plant Mo.*, *24* (*1935*), *No. 8*, *pp. 27–30*).—In tests at the Pennsylvania Experiment Station, it was found that plastic or heavy cream containing over 59.5 percent butterfat would show a cream plug on the surface and a tendency to oil off when standardized with skim milk to make whipping cream unless mechanical means were taken to prevent these troubles. Viscolizing pressures of 40 lb. or more were necessary to prevent oiling, and pressures of 80 to 100 lb. were needed to give a product that was not coarse in appearance. With such pressures, however, the whipping time of the cream was greatly increased. Colloid mills proved to be efficient for producing whipping cream from plastic and frozen cream.

The selection of Irish Free State creamery butter for cold storage, G. van B. Gilmour and P. S. Arup (*[Irish Free State] Dept. Agr. Jour., 33 (1935), No. 1 pp. 23–28*).—Continuing this investigation (E. S. R., 71, p. 525), seventy-two 56-lb. boxes of butter were stored for 6 mo. at approximately −7° C. (19.4° F.). The butters were selected so as to fall into the following groups: (1) Butters with high pH value and high flavor score, (2) butters with low pH value and high flavor score, (3) butters with high pH value and low flavor score, and (4) butters with low pH value and low flavor score. The butters were judged for flavor before and after storage, and pH value, curd percentage, and titratable acidity were determined on all butters.

The butters with high pH value kept better and had a lower average curd percentage than those with a low value. The pH determinations were a better guide to keeping properties than titratable acidity figures. A tentative standard of not less than pH 6.7 is suggested for butters that are to be cold stored.

The preparation of a non-desiccated sodium caseinate sol and its use in ice cream, E. W. Bird, H. W. Sadler, and C. A. Iverson (*Iowa Sta. Res. Bul. 187 (1935), pp. 177–208, figs. 10*).—This study was undertaken to obtain information to show whether milk proteins as added solids, in amounts that would produce a gummy product, would improve ice cream sufficiently to warrant their use.

Replacing dried skim milk in an ice cream mix with sodium caseinate sols improved the body and texture of the resulting product. This improvement was shown up to 2.5 to 5 percent replacement, depending upon the composition of the mix. The flavor of ice cream was progressively improved by the use of sodium caseinate sols up to 3 to 4 percent replacement, depending upon the composition of the mix. This improvement was due to the careful pH control used in the preparation of the sodium caseinate sols. Replacing the dried skim milk with sodium caseinate sols altered the type of melting of the ice cream, and the use of these sols increased the initial and maximum overrun and decreased the whipping time of ice cream. From 1.5 to 3 percent of the dried skim milk must be replaced by sodium caseinate sols in order to effect sufficient improvement in whip to warrant their use. A 3 percent replacement would be necessary with a mix containing 14 percent fat and 10 percent serum solids.

It is concluded that the amounts of milk protein which would be required to yield sufficient improvement in whip and in body and texture score would be large enough to make their use questionable.

Here is how to use stabilizers in making ices and sherbets, P. H. Tracy (*Ice Cream Trade Jour., 31 (1935), No. 7, pp. 21, 22*).—At the Illinois Experiment Station commercial-sized batches of water ices were made with Hygell, gelatin, gum arabic, and pectin. All batches contained 30 percent sugar and 0.5 percent citric acid. The mixes were heated to 145° F. before adding the dry stabilizer and the mixture was held at this high temperature for 10 min., after which it was cooled to 40°. Half of the batch was frozen at the end of 2 hr., and the remainder was aged at 40° for 24 hr. before freezing.

The gelatin ices whipped fast, and the overrun rose rapidly to well beyond 100 percent. This effect upon the incorporation of air was the only undesirable characteristic of gelatin when used for water ices. The Hygell product was the poorest whipper with the maximum overrun of 23 percent. The pectin ice mix whipped to 40 percent as a maximum, while the gum arabic mix whipped to 79 percent overrun. Aging did not appear to be an important factor in whipping except in the case of Hygell.

The use of the more representative types of stabilizers in the making of ices and sherbets is discussed.

Frozen brines as refrigerants for ice cream, H. H. SOMMER (*Ice Cream Rev., 19 (1935), No. 2, pp. 34, 36, figs. 2*).—The Wisconsin Experiment Station undertook a brief study to assist a manufacturer of ice cream truck bodies in the selection of a suitable brine to supply the refrigeration.

Nineteen different salt concentrations were tested to determine the freezing point of the solution and its value for maintaining ice cream in transit at a temperature of 0° to —5° F. Preliminary results suggested the use of common salt in the proportion of 22.4 lb. of salt to 77.6 lb. of water. The cryohydric point of this solution, according to physicochemical data, was —6.16°.

VETERINARY MEDICINE

A geography of disease, E. B. MCKINLEY (*Amer. Jour. Trop. Med., 15 (1935), No. 5, Sup., pp. XXV+495*).—This is a report of a preliminary survey of the incidence and distribution of tropical and certain other diseases, undertaken chiefly for its scientific value and as an aid to investigators and other workers in the field of tropical medicine. Summaries of selected diseases, with 20 special articles by as many contributors (pp. 377–453), are included.

The principal works on medical entomology in French Indochina from 1900 to 1935 [trans. title] (*Arch. Insts. Pasteur Indochine, No. 19 (1934), pp. 371–375*).—A list is given of the principal works in the field of medical entomology, exclusive of *Anopheles* and malaria transmission, in French Indochina.

[Work with animal parasites by the Georgia Station] (*Georgia Sta. Rpt. 1935, pp. 20, 21*).—Brief reference is made (E. S. R., 71, p. 836) to observations of the parasites affecting sheep and to internal parasites of swine.

Some diseases of farm animals (*[Gt. Brit.] Min. Agr. and Fisheries Bul. 1, 6. ed. (1934), pp. V+151, [pls. 5], figs. 10*).—A new edition of this practical work (E. S. R., 64, p. 260).

Report of proceedings under the Diseases of Animals Acts for the year 1934, P. J. L. KELLAND (*[Gt. Brit.] Min. Agr. and Fisheries, Rpt. Proc. Diseases Anim. Acts, 1934, pp. 90*).—The occurrence and prevention of and control work with diseases of livestock in Great Britain in 1934 are reported upon.

[Contributions on veterinary medicine] (*12. Internatl. Vet. Cong., New York, N. Y., 1934, [Rpts.], vols. 1, pp. 161–314; 2, pp. V+632, figs. 19; 3, pp. IV+548, figs. 11*).—The contributions presented at the general and sectional meetings, respectively, of the Twelfth International Veterinary Congress held in New York in August 1934 (E. S. R., 71, p. 433), are given in English, French, German, or Spanish, with abstracts in the three remaining languages, as follows:

Vol. I.—A Modern Sanitary Police, by E. Leclainche (pp. 161–170); Relationship of Veterinary Science to Animal Breeding and Public Health (Legal Protection of the Practice of Veterinary Science), by J. R. Mohler (pp. 171–188); Veterinary Milk Control, by R. von Ostertag (pp. 189–207); General Aspects on the Properties of the Ultraviruses (Filtrable Viruses), by R. Manninger (pp. 207–228); Recent Investigations of Filtrable Viruses, by F. Gerlach (pp. 228–262); New Researches on Contagious Abortion (Bang's Disease), by O. Bang (pp. 262–282); New Researches and Developments on Contagious Abortion (Bang's Disease), by W. E. Cotton (pp. 283–297); and New Researches on Contagious Abortion (Bang's Disease), by G. Finzi (pp. 297–310).

Vol. II.—Bovine Tuberculosis and B. C. G. Vaccination, by E. A. Watson et al. (pp. 2–14); Circulation of Tubercle Bacilli in Tuberculous Animals: Consideration of the Anachoresis of Ascoli and Meat Inspection, by T. van Heelsbergen (pp. 14–23); The Prophylaxis of Bovine Tuberculosis, by C. Guérin (pp. 23–33); Eradication of Tuberculosis among Livestock in the United States, by A. E. Wight (pp. 33–47); Tuberculosis: Combat, Immunity, and Protective Vaccination, by W. Zwick (pp. 48–67); The Experimental Vaccination of Calves against Tuberculosis with B. C. G., by J. B. Buxton (pp. 68–85); Foot-and-Mouth Disease: Specific Treatment, Eradication, and Differential Diagnosis, by J. Traum (pp. 87–101); The Present Methods of Foot-and-Mouth Disease Control, by G. Flückiger (pp. 101–111); Simultaneous Inoculation against Hog Cholera, by M. Dorset (pp. 115–122); Hog Cholera (Active Immunization) by J. Michalka (pp. 122–136); Anthrax Vaccination, by M. Mazzucchi (pp. 138–156); The New Methods of Vaccination against Anthrax, by J. V. Munné (pp. 157–166); Gas Edema Diseases, by J. P. Scott, A. W. Turner, and L. R. Vawter (pp. 168–187); Anaerobe Infections of Domestic Animals in the Dutch East Indies, Particularly a Specific Osteomyelitis in the Buffalo, by F. C. Kraneveld (pp. 187–200); The Problems of Gas Edemas of Bovines, by M. Mihailescu (pp. 201–217); Paratyphoid Diseases in Animals in Relation to Public Health, by A. Clarenburg (pp. 218–230); Classification of the Paratyphoid Diseases, by C. Murray (pp. 230–247); Classification of Animal Paratyphoid Diseases (Paratyphoid Diseases of Domestic Animals), by R. Standfuss (pp. 248–266); Classification of Paratyphoid Diseases, by J. Verge (pp. 267–279); Infectious Anemia of Horses, by J. von Mócsy (pp. 282–292); The Infectious Anemia of Horses, by F. Král (pp. 298–317); The Lymphadenitis of Ovines: Etiology, Source of Infection, Prophylaxis, by A. Cassamagnaghi (pp. 319–334): Mosquitoes as Vectors of the Virus of Equine Encephalomyelitis, by R. A. Kelser (pp. 336–346); Coma, Paralysis, and Convulsions during Gestation and Lactation (Milk Fever), by R. Götze (pp. 348–364); Observations on Sterility of Cattle in South Africa, by J. Quinlan (pp. 367–388); The Relation of the Sympathetic Nervous System to Reproductive Disorders of the Cow, by W. Frei (pp. 389–405); Sterility Due to Ovarian Dysfunction, by W. L. Boyd (pp. 405–417), contributed from the Minnesota Experiment Station; Sterility, by F. Schöttler (pp. 418–439); Diseases of Young Animals, by W. L. Williams (pp. 441–456); Diseases Incident to Rearing Offspring, by H. Miessner and A. Köser (pp. 457–479); Diseases Incident to Rearing Offspring, by J. Sigmund (pp. 480–492); The Control of *Streptococcus agalactiae* Mastitis, by W. Steck (pp. 494–510); *Streptococcus* Mastitis in Cattle: Bacteriology and Preventive Medicine, by F. C. Minett (pp. 511–532); *Diplococcus* Mastitis in Cows, by S. Wall (pp. 532–547); Infectious Bovine Mastitis, by M. Christiansen and F. Nielsen (pp. 548–562); Bovine Mastitis, by F. S. Jones and R. B. Little (pp. 563–579); X-ray Diagnosis and Therapy in Veterinary Medicine, by A. Pommer (pp. 585–602); Recent Progress in Veterinary Surgery, by W. F. Guard (pp. 603–616); Surgical Treatment against Crib-Biting, by G. Forssell (pp. 617–624); and Recent Progress in Veterinary Surgery, by F. Hobday (pp. 625–632).

Vol. III.—Therapeutics of Worm Diseases, by M. C. Hall (pp. 1–19); The Problem of Dishelminthization in the U. S. S. R., by K. J. Skriabine and R. S. Schulz (pp. 20–42); Immunity against Animal Parasites, by T. W. M. Cameron (pp. 44–65); Immunological Phenomena in the Field of Parasitology, by A. Kotlán (pp. 65–75); Animal Coccidioses: Biological Considerations of the Coccidia, by C. H. Pérard (pp. 78–91); Present Status of Pullorum Disease, by H. Van Roekel (pp. 92–107), contributed from the Massachusetts Experiment Station; Bacillary White Diarrhea, by K. Wagener (pp. 108–131); Avian Pest or Fowl Pest or Plague, by E. Leynen (pp. 132–144); Coryza and Other Respiratory Infections in Chickens, by J. R. Beach (pp. 144–160); Coryza Infectiosa Gallinarum, by L. de Blieck (pp. 161–181); Psittacosis, by K. F. Meyer (pp. 182–205); Fowl Pox, by T. M. Doyle (pp. 206–218); Fowl Pox, by W. T. Johnson (pp. 219–233), contributed from the Oregon Experiment Station; The Leucoses of the Fowl, by K. Jármai (pp. 235–251); Leukemia of Fowls, by E. L. Stubbs (pp. 251–262); Neurolymphomatosis Gallinarum, by F. D. Patterson (pp. 265–277); Neurolymphomatosis Gallinarum, by J. Dobberstein (pp. 278–290); The Piroplasmoses, by W. L. Yakimoff (pp. 291–314); Classification of Piroplasms of Domestic Mammals, by H. E. Hornby (pp. 314–325); Anaplasmosis, by P. J. du Toit (pp. 325–345); Leptospirosis-Icterohaemorrhagiae (Weil's Disease) in Dogs, by A. Klarenbeek (pp. 349–357); African Horse Sickness, by O. Nieschulz (pp. 358–369); The Proof of Milk Pasteurization, by H. Zeller (pp. 372–387); Uniformity in Methods of Meat Inspection and in Meat Hygiene, by H. C. L. E. Berger (pp. 389–400); Uniformity in the Inspection of Imported Meat and Meat Products, by T. Dunlop-Young (pp. 401–406); National Meat Inspection in the United States of America, by E. C. Joss (pp. 406–419); Heredity in the Breeding of Domestic Animals, by G. K. Constantinesco (pp. 422–437); The Application of Genetics to the Breeding of Domestic Animals, by É. Letard (pp. 437–449); Deficiency Diseases, by J. Marek and O. Wellmann (pp. 450–473); Deficiency Diseases, by G. H. Hart (pp. 473–487); Canine Nutrition, by R. G. Linton (pp. 488–502); Scientific Principles of Feeding, by V. Stang (pp. 503–520); Blood Groups in Animals, by Z. Szymanowski (pp. 521–535); and The Blood Groups of the Horse, by S. Schermer (pp. 536–548).

Discussions of papers follow each section.

Variations in white blood cell counts, W. E. GARREY and W. R. BRYAN (*Physiol. Rev., 15 (1935), No. 4, pp. 597–638, figs. 2*).—This contribution is presented with a 7-page list of references to the literature.

The chemical separation and biological activity of the polysaccharide constituent in Brucella cells, A. D. HERSHEY, I. F. HUDDLESON, and R. B. PENNELL (*Jour. Infect. Diseases, 57 (1935), No. 2, pp. 183–185*).—The preparation of a specific precipitating polysaccharide fraction from *B. abortus* through prolonged heat extraction, as described by Favilli and Biancalani, is confirmed by the authors.

"From the crude preparation a nonpolysaccharide, precipitating substance was separated. A similar precipitating substance was prepared by cleavage from a nonpolysaccharide antigen of *Brucella* cells. Its relation to the various soluble specific fractions of *Brucella* is suggested. The precipitating properties of the polysaccharide prepared according to the method of Favilli and Biancalani appear to be due to a nonpolysaccharide contaminant."

The pathogenicity of Brucella abortus for white mice, W. H. FELDMAN and C. OLSON, JR. (*Jour. Infect. Diseases, 57 (1935), No. 2, pp. 212–222, figs. 6*).—In the experiments conducted cattle and swine strains of *B. abortus*, when injected intraperitoneally, were pathogenic for white mice. *Brucella* agglutinins were present in the blood of the inoculated animals, and the specific organism was recoverable from the spleen. Although grossly visible evidence of a diseased state infrequently occurred, rather characteristic lesions of the kidneys and liver, and less frequently of the spleen, testes, and epididymes, were observed microscopically. It is pointed out that white mice should be satisfactory animals for the isolation of *B. abortus* from spontaneously infected material.

The susceptibility of mice to the viruses of human and swine influenza, C. H. ANDREWES, P. P. LAIDLAW, and W. SMITH (*Lancet [London], 1934, II, No. 16, pp. 859–862*).—Investigations conducted in continuation of earlier work (E. S. R., 71, p. 695), in which ferrets were infected with a virus isolated from human cases of influenza and also with a strain of swine influenza virus from the United States, are reported upon.

It was found that "in general mice react to the viruses under study much as ferrets do, but pathological changes are found in the lungs rather than the nasal passages. As in ferrets, the only successful method of infection yet found consists in introducing the virus directly into the respiratory tract.

Injection by other routes has in neither animal produced either infection or a striking immunity. . . . The swine influenza infection in mice is like that in the ferret and unlike that in the pig; the virus alone produces a severe and perhaps fatal disease, no concomitant bacteria being necessary."

The evidence that mice are susceptible to the viruses of human and swine influenza is said to rest on the following facts: "(1) Virus of ferret origin regularly produces in mice lung lesions not unlike some of those encountered in influenzal pneumonia in man. (2) After several passages through mice, the virus still produces the characteristic disease in the ferret. (3) Cultures of the lungs of infected mice on ordinary media are often sterile and do not in any case tend to yield growths of any particular organism. (4) Filtrates of infected mouse lungs through membranes having an average pore size of 0.6μ are infectious for other mice. This indicates, according to [W. J.] Elford's (1933)[4] calculations, that the diameter of the virus is less than 0.3μ. (5) The two viruses when isolated from mice are neutralized by the corresponding sera prepared in other animals."

Transmission of influenza by a filterable virus, T. Francis, Jr. (*Science, 80* (*1934*), *No. 2081, pp. 457–459*).—The results of experiments with a virus obtained from Puerto Rico during the course of an epidemic of respiratory infection in August and September 1934 are considered to have confirmed the observations of Smith, Andrewes, and Laidlaw (E. S. R., 71, p. 695) on the transfer of a filtrable, transmissible agent from human cases of epidemic influenza to ferrets. "The character of the disease in the ferret differs from that described by the British authors, in that it is more severe and is accompanied by pulmonary consolidation. In these respects, the disease in our animals appears to resemble more closely the disease produced in ferrets by Shope [E. S. R., 71, p. 696] with swine influenza virus. There has been evidence to suggest the adaptation of the virus to the ferret, for which strain P. R. 5 distinct pulmonary lesions were first noted in the sixth passage animal. . . .

"The results of the experiments, both in ferrets and mice, indicate that the agent producing the disease in these animals is a filtrable virus. It has been possible to produce the infection with filtrates, which, in aerobic and anaerobic cultures, are bacteriologically sterile. The pulmonary lesions are bacteria-free. Furthermore, the microscopic pathology of the involved lung resembles that of pulmonary lesions produced by other virus infections, rather than that of bacterial infections."

The infection of mice with swine influenza virus, R. E. Shope (*Jour. Expt. Med., 62* (*1935*), *No. 4, pp. 561–572*).—The experiments reported, in continuation of earlier work (E. S. R., 71, p. 696), confirm the observations of Andrewes, Laidlaw, and Smith (above noted) that the swine influenza virus is pathogenic for white mice when administered intranasally.

"Two field strains of the swine influenza virus were found to differ in their initial pathogenicity for mice. One strain was apparently fully pathogenic even in its first mouse passage, while the other required two or three mouse passages to acquire full virulence for this species. Both strains, however, were initially infectious for mice without the necessity of intervening ferret passages. There is no evidence that bacteria play any significant role in the mouse disease though essential in that of swine, and fatal pneumonias can be produced in mice by pure virus infections. Mice surviving the virus disease are immune to reinfection for at least a month. In mice the disease is not contagious though it is notably so in swine. The virus, while regularly producing fatal pneumonias when administered intranasally to mice, appears to be completely innocuous when given subcutaneously or intraperitoneally. Prolonged serial passage of the virus in mice does not influence its infectivity or virulence for swine or ferrets. It is a stable virus so far as its infectivity is concerned, and can be transferred at will from any one of its three known susceptible hosts to any other."

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[4] Roy. Soc. [London], Proc., Ser. B, 112 (1933), No. 778, pp. 384–406, pl. 1, figs. 8.

Infectious bulbar paralysis (pseudorabies, " peste de coçar ", Aujeszky's disease).—First contribution [trans. title], A. Braga and A. Faria (*Rev. Zootech. e Vet. [Brazil], 18 (1932), No. 3-4, pp. 149–178, pls. 4; Fr. abs., pp. 175–177; abs. in Vet. Bul., 4 (1934), No. 11, p. 655*).—A first contribution on the disease as met with in Brazil, presented with a list of 13 references to the literature.

Infectious bulbar paralysis.—Second contribution [trans. title], A. Braga and A. Faria (*Inst. Vital Brazil Bol. 16 (1934), pp. 39, figs. 21, Eng. abs.; abs. in Vet. Bul., 4 (1934), No. 11, pp. 655, 656*).—A summary is given of experiments and observations conducted by the authors commencing in December 1931. In field work convincing evidence was obtained that under normal conditions the disease is confined to bovines. "Attempts to set up the disease in 9 horses by subdural, intramuscular, subcutaneous, and intradermal inoculation of virus were unsuccessful. Eight out of 10 inoculated bovines developed typical symptoms, but only 1 of these became infected after one inoculation; some of the others withstood the inoculation as many as four times and eventually succumbed. Fatal results occurred within 36 hr. of the appearance of symptoms in bovines, dogs, rabbits, guinea pigs, and mice. In swine the symptoms continued for a week and 80 percent of the inoculated animals recovered. It was not possible to infect birds or reptiles. Rabbits and guinea pigs are suitable experimental animals, but artificial infection is not invariably successful in them."

Infectious bulbar paralysis (pseudorabies, " peste de coçar ", Aujeszky's disease).—Third contribution [trans. title], A. Braga and A. Faria (*Rev. Dept. Nac. Prod. Anim. [Brazil], 1 (1934), No. 2-4, pp. 53–152, figs. 27; Eng., Fr. abs., pp. 110–121*).—This further report of studies is presented with a list of 65 references to the literature.

The disease occurs in Argentina, Paraguay, and Brazil, in the last particularly in the States of Minas Geraes, Goiás, São Paulo, and Santa Catharina, while rabies occurs generally in the States of Santa Catharina, Mato Grosso, and Espirito Santo.

Positive experimental transmission resulted with bovines (80 percent), dogs (100 percent), rabbits (100 percent), guinea pigs (80 percent), rats (100 percent), swine (100 percent), and marsupials (gambá) (100 percent). Negative results were obtained with equines, hens, pigeons, and snakes of the genus *Bothrops*.

The microscopic examination of producer samples of milk for streptococci of mastitis, C. S. Bryan and F. T. Huber (*Vet. Med., 30 (1935), No. 10, pp. 429–432*).—In further work at the Michigan Experiment Station (E. S. R., 71, p. 245), " brilliant green in final dilution of 1–50,000 dye in milk was found to inhibit extraneous bacteria and curd formation in all but 6 percent of the producer samples and still permit reproduction and subsequent detection of the streptococci upon incubation of 12 hr. at 37° C.

" In case streptococci were found in the producer samples, cows infected with and eliminating the streptococci were found in the herd. Such producer samples contained streptococci when as few as 1 out of 18 were infected. No herds were encountered in which the ratio of infected to noninfected was greater than 1 to 18.

"In case no streptococci were found in the producer sample, the cows in the herd were found free of streptococcic mastitis."

Transmission and detection of mastitis, C. C. Prouty (*Wash. State Col., Inst. Dairying Proc., 8 (1935), pp. 127–129*).—A practical discussion.

Rodent plague in California, W. H. Kellogg (*Jour. Amer. Med. Assoc., 105 (1935), No. 11, pp. 856–859*).—The present outbreak of enzootic plague is considered to be not without significance, in that after a considerable period of quiescence the disease is actively spreading among the wild rodent population of rural areas in widely separated districts and in areas far from any formerly known focus of infection.

"The prevalence of infected squirrels near the borders of Oregon and of Nevada and on the other side of the mountain range suggests that there is no natural limitation to the spread of plague through wild rodents to places far distant from its original entry into this country in the Bay district of California. Plague is very evidently a permanent problem on the Pacific Coast, and the prospect of its becoming a problem in other States appears at the present time to be good. Especially to be feared so far as man is concerned is the pneumonic form of the disease, which, as I have already indicated, may be directly related to plague in animals of the squirrel and ground hog type."

It is pointed out in an appended note that since the writing of this article rodent plague has been officially reported from the State of Montana and three counties of Oregon.

Continued researches into the presence of trichinae in dogs and cats in Köbenhavn (Copenhagen), and a summary of the occurrence of trichinae in man and pigs in Denmark [trans. title], S. Hjortlund (*Skand. Vet. Tidskr., 25 (1935), No. 8, pp. 501–543; Ger., Eng. abs., pp. 536–542*).—In examinations made of a thousand dogs and cats in Köbenhavn during 1934 for the presence of trichinae, in which 192 preparations of each animal were examined, no case of such parasitism was observed. In 4 preparations from young dogs, *Ascaris* larvae were found encysted between the muscle fibers and surrounded by round cells.

Tuberculin, johnin, and mallein derived from non-protein media, E. A. Watson (*Canad. Pub. Health Jour., 26 (1935), No. 6, pp. 268–275, fig. 1*).—This is a brief presentation, without protocols of experiments and trials, indicating the advantages that a nonprotein synthetic culture medium may have over the commonly used nutrient broth media in the development of biological products, especially those intended or destined for use in allergic tests.

Stock-poisoning plants of California, A. W. Sampson and H. E. Malmsten (*California Sta. Bul. 593 (1935), pp. 90, pls. 3, figs. 20*).—Following a brief introduction and a discussion of the conditions of poisoning, the composition and palatability of poisonous plants, and plant poisons, the poisonous plants of primary importance (pp. 11–51), of secondary importance (pp. 51–71), and of minor or local importance (pp. 71–78) are dealt with. The composition of typical poisonous species during the period when they are most likely to cause livestock losses and a résumé of characteristics of the more common poisonous plants are given in tables. Their distribution in the State is shown on maps. Illustrations of the plant forms are given, many on colored plates. A list is given of 116 references to the literature.

Bone weakness due to nematode infestation in animals on Ladino clover pasture, R. H. Mills (*Vet. Med., 30 (1935), No. 10, pp. 424–428, figs. 10*).—Investigations of losses that occurred among cattle and sheep feeding on Ladino clover fields on three ranches in California, in which broken ribs and long bones of the body occurred, together with weakness, emaciation, and severe diarrhea, resulted in the finding of heavy infestation with lungworms (*Dictyo-*

caulus filaria) and gastro-intestinal nematodes (*Ostertagia, Trichostrongylus, Nematodirus, Trichuris*, and *Chabertia*).

It is concluded that since the animals in all instances were receiving a very satisfactory ration containing sufficient protein and sufficient minerals in the most utilizable form, there was a factor which prevented the assimilation of both the protein and bone-building elements. Since the animals showed decided improvement following the treatment for nematode parasites, the diarrhea practically stopping, the appetite returning, and deaths ceasing, the parasites are thought to be the primary cause of the condition.

Bang's disease control in State institution herds.—III and IV, Progress reports on the 16 herds for 1931 and 1932, B. S. Fritz and M. F. Barnes (*Jour. Amer. Vet. Med. Assoc., 87 (1935), No. 5, pp. 542–558*).—The details of further work (E. S. R., 70, p. 386) are presented at length in 10 tables.

Anaplasmosis observed in Wyoming, G. W. Stiles, Jr. (*Jour. Amer. Vet. Med. Assoc., 87 (1935), No. 5, pp. 579–582*).—The occurrence of anaplasmosis in cattle in two widely separated localities of Wyoming is recorded. The mortality in one outbreak was 5 of 10 cases. It is pointed out that the disease has been definitely diagnosed in 15 States, namely, Alabama, Arizona, California, Colorado, Delaware, Florida, Georgia, Kansas, Louisiana, Mississippi, Missouri, Nevada, Oklahoma, Texas, and Wyoming.

A case of bovine coccidioidal granuloma from the Southwest, G. W. Stiles, Jr., and C. L. Davis (*Jour. Amer. Vet. Med. Assoc., 87 (1935), No. 5, pp. 582–585, figs. 4*).—A case of bovine coccidioidal granuloma in a steer which was raised in New Mexico, fed in Arizona, and slaughtered for food purposes in Denver, Colo., is reported.

A hitherto undescribed pathological condition associated with pleuropneumonia contagiosa bovum: Inflammatory oedema in the epidural space and around the sciatic nerves, A. W. Turner and A. D. Campbell (*Aust. Vet. Jour., 11 (1935), No. 4, pp. 138–143, figs. 2*).—The authors report having found inflammatory gelatinous edema of the epidural space in the sacral region, with or without extension cranially to the middle thoracic region and peripherally along the sciatic nerves, associated with pleuropneumonia in seven cases in comparatively young animals and one adult cow that exhibited posterior weakness and paraplagia. In four cases the specific organism of pleuropneumonia was cultivated from the lesions.

Anomalous heart in a calf, J. F. Bullard (*Jour. Amer. Vet. Med. Assoc., 87 (1935), No. 5, pp. 577–579, fig. 1*).—A contribution from the Indiana Experiment Station.

Syringomyelia in a Jersey calf, J. F. Bullard (*Jour. Amer. Vet. Med. Assoc., 87 (1935), No. 5, pp. 575–577, fig. 1*).—A contribution from the Indiana Experiment Station.

Infectious gastroenterotoxemia (bradsot of sheep) [trans. title], G. Deronera and B. Ananiadès (*Rev. Gén. Méd. Vét., 44 (1935), No. 523, pp. 385–408, fig. 1*).—This account is presented with a list of 29 references to the literature.

An immunological study in laboratory animals of thirteen different strains of equine encephalomyelitic virus, B. F. Howitt (*Jour. Immunol., 29 (1935), No. 4, pp. 319–341*).—The work reported relates to 11 strains of equine encephalomyelitic virus isolated from different localities of the United States which could be divided serologically into two groups, "one from the West (California, Nevada, Utah (Nos. 1 and 5), Colorado, South Dakota, and Minnesota) and one from the East (New Jersey (Nos. 1, 2, and 3), Maryland (Md. 1), and Delaware). The strain of virus obtained from the Argentine was classified with the western series, while that from Russia was immunologically distinct from the others and varied in a few characteristics.

"There was no in vitro cross neutralization nor in vivo cross protection between serums of any group when tested against the heterologous viruses. Protection occurred, however, between homologous serums and viruses of each type.

"Animals immunized to each member of the three divisions showed a constant tissue immunity within their own groups when tested intracerebrally, but cross-injection experiments were not conclusive, except for the Russian virus which was differentiated from the others. A certain percentage of guinea pigs immune to the western American strains showed immunity when tested with the eastern and vice versa. The numbers of animals succumbing or surviving after injection with heterologous strains was approximately proportional for both eastern and western American varieties. Young guinea pigs born of immune parents and immune to their respective American viruses were more susceptible to injections of the heterologous strains than older animals hyperimmunized with massive doses of live virus.

"The American eastern strains of virus were found to be far more invasive and potent than the western, both by intracerebral and by intradermal inoculation of guinea pigs, although the virulence of both could be enhanced by repeated animal passage. Rabbits were found to be more susceptible to the eastern American strains than to any of the others and could even be infected intravenously. The Russian virus was also invasive for rabbits when given intracerebrally, but not when into the veins.

"Comparison of potency was best demonstrated by titration methods.

"Although three serological groups of equine encephalomyelitic virus may be differentiated, there is a probability that the strains isolated from horses in the various localities have sprung from a common rootstock and should therefore be considered as varieties or subvarieties of the identical virus causing the same clinical disease."

Epidemiology of equine encephalomyelitis in the eastern United States, C. TenBroeck, E. W. Hurst, and E. Traub (*Jour. Expt. Med., 62 (1935), No. 5, pp. 677–685, figs. 3*).—The studies reported led to the conclusion that "equine encephalomyelitis of the eastern type is a disease of the late summer and fall, and cases are found in greatest numbers near salt marshes. The epidemiological findings are against its transmission by contact and favor the view that it is insect borne. Although virus can be demonstrated in the blood of infected horses, it is present for a relatively short time, and the possibility that the disease is not primarily an infection of horses but that it is transmitted to them from another host is considered."

The transmission of equine encephalomyelitis virus by Aëdes aegypti, M. H. Merrill and C. TenBroeck (*Jour. Expt. Med., 62 (1935), No. 5, pp. 687–695*).—In confirming the work of Kelser (E. S. R., 69, p. 434) on the transmission of equine encephalomyelitis of the western type by the yellow-fever mosquito, it has been learned that mosquitoes must be fed virus of high titer if positive results are to be secured. "A period of from 4 to 5 days after feeding either on infected guinea pigs or on brain containing virus must elapse before the disease is transmitted by biting, but after this time transmission regularly results for a period of about 2 mo. By inoculation, virus can be demonstrated in the bodies of infected mosquitoes for the duration of life.

"Although virus multiplies in the mosquitoes and is generally distributed in their bodies, repeated attempts to demonstrate it in the eggs from females known to be infected as well as in larvae, pupae, and adults from such eggs have been uniformly negative. Larvae have not taken up virus added to the water in which they were living. Male mosquitoes have been infected by virus by feeding, but they have not transmitted the virus to normal females, nor have males transmitted the virus from infected to normal females.

"When virus of the eastern instead of the western type is used, transmission experiments with *A. aegypti* are negative. Apparently this virus is incapable of penetrating the intestinal mucosa of the mosquito. If, however, it is inoculated into the body cavity by needle puncture it persists and transmission experiments are positive."

Ultrafiltration experiments with the viruses of laryngotracheitis and coryza of chickens, C. S. GIBBS (*Jour. Bact., 30 (1935), No. 4, pp. 411–417*).—Contributing further from the Massachusetts Experiment Station (E. S. R., 72, p. 259; 73, p. 395; 74 p. 106), the author describes an improved technic for the ultrafiltration of laryngotracheitis and coryza viruses, in which the respective tracheal and nasal exudates are triturated in distilled water with powdered Pyrex glass until the mass is worked into a smooth emulsion. "Then, 0.04 M solution of citric acid is added, drop by drop, until the isoelectric point is reached, and the cellular debris flocculates and begins to settle to the bottom of the tube, leaving an almost clear supernatant suspension of the virus above. The settling of the flocculant material may be hastened by centrifugalization. The supernatant fluid is either poured or pipetted off and neutralized with a 0.04 M solution of sodium carbonate, using bromothymol blue as an indicator.

"The neutralized virus suspension is filtered through a graded series of collodion membranes and the size of its particles estimated. This technic shows some improvements over the methods that are commonly employed in ultrafiltration studies, and should find extensive use in bacteriological laboratories for the study of filtrable viruses in general."

The survival of the virus of infectious laryngotracheitis in the bursa of Fabricius and cloaca of chickens after "intrabursal" injection, J. R. BEACH (*Jour. Infect. Diseases, 57 (1935), No. 2, pp. 133–135*).—In the experiments conducted, "active laryngotracheitis virus was not detected in the bursa of Fabricius of young chickens later than the seventh day following injection of virulent virus into the bursa. This time interval corresponded to that during which the visible inflammatory reaction of the cloacal mucous membrane to the virus was present in the chickens. These results, together with those of others to which reference is made, suggest that in about 1 week after vaccination against laryngotracheitis chickens cease to be virus carriers."

Some studies of infectious laryngotracheitis: The continued propagation of the virus upon the chorio-allantoic membrane of the hen's egg, C. A. BRANDLY (*Jour. Infect. Diseases, 57 (1935), No. 2, pp. 201–206, figs. 3*).—This contribution from the Kansas Experiment Station describes the procedure and technic and the effect on the chorioallantois and the embryo resulting from the introduction of laryngotracheitis virus into developing eggs.

The possibility of continued propagation of the virus of laryngotracheitis upon the chorioallantoic membrane of the developing hen's egg, as carried out in these experiments, is considered to emphasize the simplicity and advantages of the procedure. "It has been demonstrated that, with reasonable care, continued direct egg to egg transfer of the infection may be accomplished without encountering contamination. Furthermore, a highly potent pure virus is made available for study. Egg virus is well suited for the study of the mechanism of immunity and for use in in vitro serological tests. Large quantities of the pure virus may be economically produced for the vaccination of chickens by the cloacal method. Greater accuracy in titrations of the virus may reasonably be expected by employing the developing egg rather than the chicken. The developing egg provides a completely isolated organism ideally adapted and highly valuable for studies of this nature, particularly where minimal facilities and equipment are available.

"Some rather marked variations in the extent of infection of the chorioallantois as well as in the survival time of the embryo were encountered. Among the factors to which such differences may be attributed are (1) slight variations and inaccuracies in the technic of introducing the virus, (2) inconsiderable differences in the degree of trituration effected with various lots of virus, and (3) variations in the environment (humidity and temperature) to which the eggs are subjected during incubation."

Fifteenth annual report on eradication of pullorum disease in Massachusetts, H. Van Roekel et al. (*Massachusetts Sta. Control Ser. Bul. 78 (1935), pp. 12*).—The results of eradication work with pullorum disease during the year 1934–35 (E. S. R., 72, p. 538) are reported upon, the details being given in seven tables. In a discussion of the results it is pointed out that progress is being made in the eradication of the disease as revealed by increases in the number of tested birds and tested samples, of which only 0.39 percent were positive. The average percentage of positive tests was the lowest obtained during the 15-yr. testing period. Salient factors which play a part in successful eradication are emphasized.

An account of two infection experiments conducted with feces from reacting birds with the view to determining the possibility of spreading the infection by means of droppings is included in the report, the details being given in tables. The results obtained indicate that while the incidence of infection is small, feces from positive-reacting birds when force-fed to nonreacting birds may act as a vehicle of transmission for pullorum disease. There was no apparent direct correlation between the agglutination titer of the infected birds and the infectivity of their feces to transmit the disease to susceptible fowl. Of the 6 positive-reacting birds whose corresponding nonreacting birds developed agglutinins, 4 exhibited a relatively low agglutination titer.

The whole blood agglutination test for pullorum disease, H. Van Roekel and M. K. Clarke (*Massachusetts Sta. Bul. 323 (1935), pp. 24, figs. 5*).—Following a historical account, presented with a list of 11 references to the literature, and a discussion of the technic of testing methods used, miscellaneous experiments and experimental testing in commercial flocks are reported, the details being given in 11 tables.

In the experimental work the whole blood agglutination test was not as efficient as the standard tube agglutination method. It was found that factors such as proper and constant temperature, adequate light, and an effective and constant whole blood antigen dilution influence the sensitivity and efficiency of the whole blood agglutination test. "Great variation was observed in the whole blood antigen dilution. The lack of constancy in this dilution exerted a perceptible influence on the degree of agglutination and played an important role in detecting low titer birds. Delayed weak reactions occurred in a few instances with blood obtained from birds that harbored *S[almonella] pullorum*. The standard tube test detected infected birds which failed to react with the whole blood test. The adoption of the whole blood test as the sole diagnostic means for establishing and identifying pullorum disease-free flocks seems inexpedient at the present time."

The metabolic activity of various colon-group organisms at different phases of the culture cycle, G. Mooney and C. E. A. Winslow (*Jour. Bact., 30 (1935), No. 4, pp. 427–440, figs. 2*).—Studies of the production of carbon dioxide by *Escherichia coli*, *Salmonella pullorum*, and *S. gallinarum* in continuously aerated media at various periods of the culture cycle are reported upon.

"The presence of a fermentable sugar (glucose) in an aerated medium stimulates the multiplication of *E. coli* and *S. gallinarum* but tends to inhibit the development of *S. pullorum*. This inhibitive effect can be removed by the addition of sodium chloride. In no case is the presence of glucose accompanied by any significant increase in the rate of production of carbon dioxide per cell per hour. The production of carbon dioxide per cell per hour at a corresponding period of the culture cycle seems to be essentially independent of the species of organism studied and of the medium used. It would appear therefore to represent a fundamental metabolic activity which is of the same order of magnitude in the three organisms."

Renal monostomosis of domestic fowls [trans. title], V. dos Santos (*Rev. Dept. Nac. Prod. Anim.* [*Brazil*], *1* (*1934*), *No. 2–4*, *pp. 203–215*, *figs. 4*; *Fr.*, *Eng. abs.*, *pp. 208–211*).—The author has found 15.7 percent of the pigeons examined from Rio de Janeiro and the vicinity to be infested by a new species of trematode of the genus *Tamerlanea* (*T. bragai*) which occurs in the collecting tubules of the kidneys and in the ureters. It has also been observed in the kidneys of two hens.

The effect of certain ectoparasites on the cellular elements and hemoglobin of the blood of the domestic chicken, C. Olson (*Jour. Amer. Vet. Med. Assoc.*, *87* (*1935*), *No. 5*, *pp. 559–561*).—A report is made of observations of the number of cells and quantity of hemoglobin in the blood of two groups of five chickens each. The chickens were severely infested with lice (the chicken body louse, the large chicken louse, the fluff louse, and *Lipeurus variabilis*). One group was segregated in clean quarters and kept deloused for 30 days. Examinations of the blood then were repeated.

"A slight anemia was found in the infested group, apparently as a result of the effect of the ectoparasites. Thrombocytosis and moderate leucocytosis was observed in the infested group after they had been hosts to the ectoparasites for a period of at least 30 days; these two phenomena are of uncertain significance. No changes of the differential counts of the leucocytes were observed.

"These observations indicate that severe infestation of chickens with lice in all probability is not associated with any marked anemia."

Capillarine nematode parasites of the esophagus and craw of fowls [trans. title], J. F. Teixeira de Freitas and J. Lins de Almeida (*Mem. Inst. Oswaldo Cruz*, *30* (*1935*), *No. 2*, *pp. 123–156*, *pls. 6*).—Of the 16 species of *Capillaria* described, 5 are new to science. A host list and a bibliography of 7 pages are included.

Study of a nematode (Oshimaia taiwana (Sugimoto 1919)) from Formosan duck, and filariasis of the duck, M. Sugimoto (*Jour. Soc. Trop. Agr.* (*Nettai Nôgaku Kwaishi*), *6* (*1934*), *No. 3*, *pp. 437–458*, *pl. 1*, *figs. 4*; *Eng. abs.*, *p. 456*).—This contribution relates to a nematode parasite found in the connective tissue of subcutaneous tumors in young ducks, mostly on the chin, thigh, etc. This filariasis is said to prevail especially from April to May and from September to October.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations by the Pennsylvania Station], A. W. Clyde, C. O. Cromer, J. E. Nicholas, and D. C. Sprague (*Pennsylvania Sta. Bul. 320* (*1935*), *pp. 10–12*, *fig. 1*).—Progress results are briefly presented of studies on rubber tires for tractors, artificial curing of alfalfa, stop hitches for tractors, farm milk-cooling plants and their performance, a low-pressure steam sterilizer for milk pails on dairy farms, the mechanics of plow and tractor hitches, and a vegetable seeder and cultivator for the one-plow tractor.

The design of overhead irrigation systems, E. S. West and A. Howard (*Aust. Council Sci. and Indus. Res. Pam., 50 (1934), pp. 39, pls. 6, figs. 15*).—This publication discusses the advantages and disadvantages of overhead irrigation systems as compared with surface methods, and describes a system of spray irrigation in use.

Investigations into the hydraulics of the system are reported and the results discussed. From these investigations formulas which show the relationships between the pressures of water used, discharge from the laterals, and fall in pressure along the laterals, when the constants depending on the friction loss of laterals and discharges from orifices are known, are elaborated.

Engineering data also are included on costs and methods of installation and design. Three appendixes relate to construction of mains, methods used in hydraulic investigations of laterals, and illustrations of the use of the tables of engineering data.

Soil erosion, Archer Field Station, A. L. Nelson (*Wyoming Sta. Bul. 208 (1935), pp. 35, figs. 18*).—The investigations reported in this bulletin were conducted in cooperation with the U. S. D. A. Bureau of Plant Industry.

It was found that soil blowing takes place in this region in damaging amounts, but that most of the productive soils can be farmed without undue damage by using care in practical operations.

Apparently the greatest danger from soil blowing occurs on fallow land generally seeded to winter wheat and on row-cropped land, especially if sandy.

Factors that aid in the control of soil blowing are shallow tillage of a nature that produces clods and leaves the organic matter at the surface, ridging the soil at right angles to the prevailing winds, strip farming, the growing of sod crops, and providing shelter belts or windbreaks.

Soil erosion control by engineering methods, H. B. Roe and J. H. Neal (*Minn. Univ. Agr. Ext. Spec. Bul. 171 (1935), pp. 24, figs. 19*).—Practical information of a technical character is presented for use by engineers in the design and construction of erosion control measures.

It has been found that no part of a terrace grade should exceed 0.4 ft. in 100 ft., and the total length of the terrace should never exceed 2,000 ft. None of the terrace slopes should ever be steeper than 1 ft. vertical rise to 4 ft. horizontal run. Reduction of the grade of gulley floors to 2 ft. or less per 100 ft. is essential. This is done best by check dams of brush, stone, or concrete laid across the gulley floor.

Public Roads, [October 1935] (*U. S. Dept. Agr., Public Roads, 16 (1935), No. 8, pp. 145–168+[2], figs. 26*).—This number of this periodical contains the current status of U. S. Public Works road construction as of September 30, 1935, and the following articles: The Structural Design of Concrete Pavements.—I, A Description of the Investigation, by L. W. Teller and E. C. Sutherland (pp. 145–158); and Road-Building Limerocks, by R. C. Thoreen (pp. 159–165).

Wood handbook, R. F. Luxford, G. W. Trayer, et al. (*U. S. Dept. Agr., Forest Serv., Forest Prod. Lab., 1935, pp. 326, pls. 6, figs. 64*).—This handbook contains basic information on wood as a material of construction, together with data for its use in design and specification. Important sections deal with structure of wood; characteristics of some important commercial woods; physical properties of wood; strength values of clear wood and related factors; grades and sizes of lumber; structural timbers; timber fastenings; wood beams, columns, and arches; glued wood construction; bent wood members; control of moisture content and shrinkage of wood; fire resistance of wood construction; painting and finishing wood; protection against wood-destroying organisms; wood preservation; poles, piling, and ties; and thermal insulation.

Wood structural design data, I, computed and arranged by R. G. KIMBELL, A. T. UPSON, M. C. AHERN, ET AL. (*Washington, D. C.: Natl. Lumber Mfrs. Assoc., 1935, vol. 1, pp. 296, figs. 74*).—This volume provides information useful in designing certain types of wood structural members. Sections are included on physical properties of wood; chemical properties of wood; mechanical properties of wood; timber quality-strength relations; glossary of lumber terms; abbreviations of lumber terms; board measure; lumber quantity costs; sizes of American standard yard lumber and timbers; notations and technical symbols; properties of American standard lumber sizes; wood beams, design; wood beams, safe loads, limited by deflection; wood beams, safe loads, determined by bending; wood columns, design; wood columns, safe loads, dressed sizes; wood columns, safe loads, rough sizes; plank and laminated floors, design; plant and laminated floors, safe loads; supplement, working stresses; and decimal equivalents.

The shrinkage of wood during drying (*Aust. Council Sci. and Indus. Res., Div. Forest Prod., Trade Circ. 23 (1934), pp. 15, figs. 3*).—Engineering information is given on the shrinkage of wood during drying covering the reason for shrinkage of wood during drying, the difference between radial, tangential, and longitudinal shrinkage, and the resultant effect on the shape of the piece being dried. Data also are given on the variation of shrinkage between species. Apparently it is the removal of combined moisture which causes shrinkage, and this, therefore, involves lowering of the moisture content below the fiber saturation point.

Timber bending (*Aust. Council Sci. and Indus. Res., Div. Forest Prod., Trade Circ. 22 (1934), pp. 14, figs. 8*).—The fundamental principles of timber bending are presented in this circular.

Collapse and the reconditioning of collapsed timber (*Aust. Council Sci. and Indus. Res., Div. Forest Prod., Trade Circ. 20 (1934), pp. 22, figs. 8*).—This is a compilation of engineering information on the reconditioning of collapsed timber.

The holding power of special nails, I. LANGLANDS (*Aust. Council Sci. and Indus. Res. Pam. 46 (1933), pp. 30, pls. 3, figs. 8*).—In the studies reported in this paper over 4,000 nails, representing 15 types of special nails and 2 makes of plain nails, were tested for static and impact holding power. The relative importance of static and impact holding power is discussed, and the methods adopted for determining these values are described. The tests included nails driven into dry wood and pulled immediately and nails driven into dry wood and pulled 3 mo. later at a somewhat lower moisture content.

The results showed that the rusted nail had the highest static holding power, while the twisted nails had the highest impact holding power. The static and impact holding powers have been combined to form combined composite figures, which are considered to be the best criterion of the efficiency of the nails under service conditions. The combined composite figures show that the twisted nail made from square wire is superior to all others in all-round efficiency. Next in order is the rusted nail and the twisted nails made from grooved wire. With the exception of the cement-coated twisted nails and a certain type of barbed and cement-coated barbed, the other types of nails showed no significant improvement over the plain nail.

Tractive efficiency of the farm tractor, J. B. DAVIDSON, E. V. COLLINS, and E. G. MCKIBBEN (*Iowa Sta. Res. Bul. 189 (1935), pp. 257–333, figs. 95*).—This publication treats specifically the application of tractor power to a towed machine or to a load pulled by a drawbar, but farm power is treated briefly in a broad way to establish relationships. The investigational work reported has been directed toward the determination of tractive efficiency, or the ratio between power delivered for useful work at the tractor drawbar and power developed by a mechanical motor under the influence of such variable factors as traction equipment (steel wheels, pneumatic tires, tracks, etc.), weight, height of hitch, and traction surface. In the tests reported the power was measured as it was delivered to the traction members, and the input so obtained was not actually the power supplied by the motor.

Concerning steel tractor wheels, the rolling resistance of tractors over the tractive surfaces was the principal cause for low efficiency. Lugs or grousers of excessive length used to increase adhesion on a firm surface or turf may cause considerable loss in efficiency. With a wheel tractor weighing 5,620 lb., the power required to overcome rolling resistance at a speed of 3 miles per hour varied from 2.45 hp. with drivewheels without lugs to 6.3 hp. with drivewheels equipped with 4-in. spade lugs. Because of the lugs, rolling resistance on oats stubble did not differ greatly from that on freshly plowed land.

On a loose soil of uniform texture an increase in length of spade lugs from 4 to 7 in. increasingly lowered tractive efficiency, and on the same soil an increase in the width of the tire by use of an extension rim gave higher tractive efficiency. On soil with a loose surface but firm subsurface, a spade lug 9 in. long, reaching firm soil, resulted in a slightly increased efficiency over 6- and 7-in. lugs, but was less than for 4- and 5-in. lugs.

Five-in. angle lugs mounted on a wheel 42 in. in diameter with a rim 12 in. wide gave higher tractive efficiency than spade lugs on freshly prepared loose soil. Extension angle iron lugs increased tractive efficiency on loose soil materially, about one-fifth to one-fourth. Angle iron lugs extending over wheel rims were advantageous on sticky soil because the soil did not pack in between the lugs. Increasing the weight from 1,750 to 2,250 lb. on a 12 by 42-in. traction wheel equipped with spade lugs increased the drawbar pull 75 to 100 lb. at maximum efficiency. The drawbar pull was increased approximately 200 lb. when the wheel was equipped with extension rims and angle lugs. Angle iron lugs gave slightly better results with a 6-in. rim extension than without on freshly prepared loose soil. Open-type traction wheels performed practically the same as 12-in. rim wheels with lugs on firm traction surfaces of cinders or sod. The rim did not function, as the weight was carried entirely on the lugs. On loose, freshly prepared soil where the space between the lugs did not fill with soil, the rim wheel gave slightly higher tractive efficiency than open wheels. The tractive efficiency of steel drivewheels was progressively raised by increasing the diameter from 38 to 58 in. by 4-in. increments. The effect of wheel diameter is more marked on less firm traction surfaces. The rolling resistance of a wheel tractor, defined herewith as drawbar pull or its equivalent required to move the tractor over a given surface, was materially reduced by low-pressure pneumatic tires for all conditions observed. On a smooth hard surface the maximum tractive efficiency of a tractor equipped with pneumatic tires was 84 percent. The maximum drawbar pull of a tractor equipped with low-pressure pneumatic tires was materially reduced on stubble and loose soil, and can be increased by additional weight, chains, or lugs. The maximum tractive efficiency was increased progressively with a decrease of inflation pressure from 20 to 16, 12, and 8 lb. per square inch.

The tractive efficiency of a track tractor as observed is not materially influenced by normal variations of traction surfaces. On freshly prepared loose soil maximum tractive efficiency of a track was lowered by increasing the height of hitch.

A machine for the subsurface treatment of soils with chloropicrin and with carbon bisulfide for nematode control under field conditions, J. R. Neller and R. V. Allison (*Soil Sci., 40 (1935), No. 2, pp. 173–179, pl. 1*).—In a contribution from the Florida Everglades Experiment Station a machine is described which is based upon the mole principle and which has been developed in a manner such that chloropicrin and other disinfecting liquids may be applied in a continuous manner beneath the soil surface. The rate of flow is calibrated from the speed of the equipment and the amount of liquid ejected for a unit of time.

Farm building plans, compiled by H. H. Gordon and S. H. Byrne (*Blacksburg: Va. Polytech. Inst., [1935], pp. 110, figs. 87*).—The purpose of this compilation of plans is to provide engineers and building supply dealers with farm building plans for distribution. It has been prepared in cooperation with the U. S. D. A. Bureau of Agricultural Engineering. Bills of material are given in most cases.

Comparative heat loss tests on insulated and un-insulated buildings in the electrified Mason City and Grand Coulee Dam site, H. J. Dana and R. E. Lyle (*Wash. Engin. Expt. Sta. Bul. 45 (1935), pp. 26, figs. 9*).—Studies are reported, the purpose of which was to determine the actual average working effectiveness of applying heat insulating material to an uninsulated house. The studies were confined primarily to 3-room houses which were approximately 20 by 28 ft. in size, set on concrete piers, and boxed clear to the ground, after which they were banked with earth. The side walls were of 0.75-in. sheathing, tar paper, and matched siding. The roof was of 0.75-in. ship lap covered with red roofing felt. On the inside all walls and ceiling were finished with 0.5-in. wheat straw product insulating material. This material, which comes in large sheets, was nailed to the 2 by 4 studding and ceiling joists, and the joists were covered with thin wooden strips or battens. The floors were of double thickness with tar paper between. There were no basements, and all residences were single story. There was a small space between the ceiling and the roof, with vent louvres in each gable.

Three-wire electrical service to each house provided 120 v for lights and refrigeration, 120–240 for the electric range, and 240 for the electric air heaters and for the water heater. Six different kinds of building insulation were included in the test. The data are presented in graphic form and they indicate the saving of heat which can be accomplished by intelligent insulation.

The comparative life, fire, and explosion hazards of common refrigerants, A. H. Nuckolls (*Underwriters' Labs. Misc. Hazard No. 2375 (1933), pp. 118, figs. 20*).—These studies were organized to cover both life hazard and fire and explosion hazards, and they are reported in considerable detail. The object of the studies was to afford a practical basis for a comparison of the hazards of refrigerants under similar test conditions.

It was found that sulfur dioxide gas in concentrations of 0.5 to 1 percent is lethal or produces serious injury on exposure for 5 min., ammonia and methyl bromide in concentrations of 0.5 to 1 percent are lethal or produce serious injury on exposure for 0.5 hr., methyl formate, chloroform, and carbon tetrachloride in concentrations of 2 to 2.5 percent are lethal or produce serious injury on exposure for 1 hr., and dichlorethylene, methyl chloride, and ethyl bromide in concentrations of 2 to 2.5 percent are lethal or produce serious injury on exposure for 2 hr. Two other groups were much less toxic.

Data are presented on the life hazard of refrigerants in the presence of small and large gas flames and oil and wood fires.

A large amount of data is given on the fire and explosion hazards of a number of refrigerants, including ethane, propane, butane, gasoline, methyl formate, illuminating gas, methyl chloride, ethyl chloride, dichlorethylene, ethyl bromide, and ammonia.

Pumps for farm water supply, C. A. Cameron Brown (*Oxford: Univ. Oxford, Inst. Res. Agr. Engin., 1934, pp. 42, pls. 4, figs. 6*).—Engineering information on pumps for farm water supply is presented. The information relates particularly to small electrically driven pumps capable of delivering in the neighborhood of 250 gal. per hour.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics by the Georgia Station, 1934–35] (*Georgia Sta. Rpt. 1935, pp. 6–8*).—Included are brief statements regarding (1) improvement in staple lengths of cotton in different sections of the State from 1927 to 1934–35 as found in the study of cotton grade and staple statistics, and (2) the increase from 1928 to 1932 in the number of properties and acreages delinquent for taxes as shown in the study of farm tax delinquency and land transfers, made in cooperation with the Bureau of Agricultural Economics, U. S. D. A.

Effects of changing economic conditions on farming in a good community in central Indiana, E. L. Butz and L. Robertson (*Indiana Sta. Bul. 397 (1935), pp. 28, figs. 10*).—One hundred farmers in Forest and Johnson townships, Clinton County, had an average farm income above operating expenses (not including interest on their capital or value of their own labor) of $493 in 1932 as compared to an average of $2,534 for 100 farms during the war period (1916–19) and $1,407 for 100 farms during the pre-war period (1910 and 1913–15).

The quantity of all products sold in 1932 was about 10 percent greater than in the pre-war period, but prices received for them were about 37 percent less. This resulted in farm receipts only about 70 percent as large in 1932 as in the pre-war period. Operating expenses were 13 percent more in 1932 than in the pre-war period, leaving a farm income only one-third as large.

The average capital per farm at 1932 valuations was only 51 percent as high as in the pre-war period and 41 percent as high as in the war period, in spite of an increase of 22 acres in the average size of farm and a 55 percent increase in the amount of livestock per farm from the pre-war period to 1932.

The value of farm land per acre (without buildings) decreased 57 percent from the pre-war period to 1932, but the value of farm buildings per acre increased 29 percent.

In the pre-war period, 32 of the 100 farms carried an average mortgage indebtedness of $2,486 and in 1932, 47 farms had an average mortgage indebtedness of $4,097. Figured as a percentage of real-estate valuation, however, the mortgage load on the 100 farms increased 386 percent during the same period.

"Changes in land use from the war period to 1932 included an increase in corn acreage, a decrease in acreage of clover and timothy hay, and an increase in acreage of soybeans and alfalfa.

"Numbers of hogs on the 100 farms increased on a percentage basis more rapidly than numbers of cattle but less rapidly than numbers of sheep or poultry. Cattle emphasis tended to shift from beef to dairy. Sales of poultry and eggs increased greatly in proportion to numbers of hens kept.

"The number of work animals per farm decreased from 4.7 during the war to 3.5 in 1932, although the average size of farm increased 17 acres in that time, and the number of farms with tractors increased from 7 during the war period to 49 in 1932.

"In 1932 each worker on the farms cared for a 15 percent larger acreage of crops and 50 percent more livestock than in the war period.

"A larger percentage of the land was rented in 1932 than in the war period, due to an increase in the proportion of both full tenants and owners-additional, and incomes of landlords and owner-operators were less favorable compared to those of tenants.

"Total property taxes levied in Forest township rose from $20,000 in 1915 to $62,000 in 1922, dropped about one-fourth in 1923 when property assessments were lowered, and then rose again to $57,000 in 1929, after which they dropped to $27,000 in 1933."

Part-time farming in Washington, B. H. Pubols (*Washington Sta. Bul. 316* (*1935*), *pp. 47, figs. 5*).—Part-time farming in the State of Washington, to conserve resources and lower cost of living while working at some occupation not connected with the farm, is found to have increased in importance during the past few years. The farms are located mainly within or adjacent to urban and industrial centers west of the Cascade Mountains.

In 1933 the most common size of part-time farms was 2 acres and the most common acreage in crops from 0.5 to 1 acre. The average value per farm, including land and buildings, was $2,771 for the entire State, the most usual value ranging between $2,300 and $2,500. The value of dwellings was most frequently within the range of $500 and $2,100. Nearly all part-time farms had a vegetable garden and a cow or poultry. Sixty-six percent of the farms studied reported a gross value of farm products of less than $300, but more than 3 percent reported products valued at $1,000 or more. The State average was $294 per farm. Thirty percent of the farms reported no sales, 53 percent sales ranging from $1 to $199, and 17 percent sales amounting to $200 or more. Expense of production averaged $131 per farm, or 45 percent of the average value of farm production in the State. Family living expenses averaged $624 per farm, and on 63 percent of the farms this expense fell within the range of $250 to $750.

Part-time farmers traveled an average of 5 miles to their work in 1933, more than 57 percent traveled less than 5 miles, and only 6 percent traveled a distance of 15 miles or more.

The most important occupations followed by part-time farmers were lumbering and skilled trades.

Of 1,500 part-time farmers, 335, or 22 percent, received some relief assistance in 1933, averaging $90 per case. Total nonfarm income averaged $778 per farm in 1933. Of the 1,500 owner-operated part-time farms, 31 percent were dairy farms, 22 percent general farms, 21 percent poultry farms, 16 percent truck farms, 5 percent fruit farms, and 5 percent miscellaneous combination types of farms. Of the total value of farm production, 33 percent was derived from poultry, 30 from dairy products, 16 from vegetables, 9 from fruits and berries, and 12 percent from miscellaneous products.

Sales value and assessed value of Nebraska farm land, 1921–1934, E. H. Hinman (*Nebraska Sta. Res. Bul. 77* (*1935*), *pp. 24, figs. 13*).—Nebraska farm land prices fell much more rapidly than assessed valuations during the 12 yr. ended March 31, 1933. The assessed valuation of farm land remained approximately constant from April 1921 up to and including the year ended March 1, 1929, in the western part of the State, and up to and including the year ended March 31, 1932, in the eastern part of the State. In consequence, the ratio of assessed value to sales value rose during this period and remained high even after valuations had been cut.

Assessed valuations vary widely from their potential sales value in such a way that a disproportionate amount of the tax burden is placed on the poorer farms. In every geographic district, as shown in this study, the cheap land was seriously overvalued by the assessors and the good land undervalued in relation to the average assessment ratio. Overassessment and consequent overtaxation of the inferior farms was probably a contributory cause to the large amount of tax delinquency occurring on such farms during the trough of the depression (1931–33).

Among the suggested remedies are that the office of the local assessor should be made appointive instead of elective. The local assessor should be made directly responsible to the county assessor, and he, in turn, to a State official such as the State tax commissioner or to a body such as the State tax commission. The entire personnel of tax administration should be taken out of politics. The more permanent factors, such as the depth and character of the surface soil and subsoil, natural drainage, topography, climate, and possible losses from erosion, are so important that a scientific classification of land on the basis of these factors would be highly useful to tax authorities in assessing land for taxes and to government agencies in evolving a land use policy.

Preliminary estimates of the production and utilization of milk in Pennsylvania, F. F. Lininger and T. K. Cowden (*Pennsylvania Sta. Tech. Paper 680 (1935), pp. [6]; abs. in Pennsylvania Sta. Bul. 320 (1935), p. 9*).—This mimeographed paper includes preliminary tables showing the volume of milk handled in April 1934 by milk dealers licensed by the Pennsylvania Milk Control Board, the production and utilization of milk in Pennsylvania in 1933, and an estimate of the demand for all dairy products in the State compared with the supply sold by Pennsylvania farmers.

The consumption of fluid milk and other dairy products in Philadelphia, Pennsylvania, June 1934, T. K. Cowden and A. Sturges (*Pennsylvania Sta. Tech. Paper 659 (1934), pp. [47], figs. 3; abs. in Pennsylvania Sta. Bul. 320 (1935), p. 9*).—This mimeographed paper includes preliminary tabulations, analysis and discussion of data gathered in June 1934 from 3,004 families within the city limits of and 409 families in the suburbs of Philadelphia. The study was made to determine the per capita consumption of fluid milk and various dairy products and the influence of such factors as income, nationality, size of family, etc., on the consumption.

Economic development of the cotton-textile industry in the United States, 1910–1935, compiled by E. L. Day and R. P. Lane (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 57 (1935), pp. IV+141*).—This selected bibliography "lists books and periodical articles descriptive of the general development of the cotton-textile industry in the United States and of specific conditions which affected its development during the period 1910–1935. . . . The references are arranged chronologically by date of publication and alphabetically by author (or title when anonymous) under the year." References to sources of statistics are included in a supplementary section, and an author and subject index is appended.

Index number of Iowa farm products prices, G. M. Cox (*Iowa Sta. Bul. 336 (1935), pp. 297–328, figs. 5*).—This bulletin describes in detail the methods used in constructing monthly and annual index numbers of Iowa farm product prices. The 10 products included in the index are hogs, cattle, sheep, corn, oats, wheat, hay, butter, eggs, and poultry. Tables show the monthly index numbers January 1910 to March 1935, inclusive, and the annual index numbers from 1910 to 1934, inclusive. Other tables included show the monthly prices of each of the 10 products January 1910 to December 1934, inclusive; the monthly relations of such prices (1910–14=100); the annual cash income from different

Iowa farm products (1924 to 1933) in dollars and in percentages of total income; the monthly and annual marketing of the 10 products for periods of years and other data used in construction of index numbers.

Variations in prices received by farmers for products in the various crop reporting areas in Pennsylvania during selected periods from 1910 to 1934, F. P. Weaver (*Pennsylvania Sta. Tech. Paper 690 (1935), pp. 19, figs. 6; abs. in Pennsylvania Sta. Bul. 320 (1935), p. 10*).—This mimeographed paper supplements the bulletin previously noted (E. S. R., 73, p. 121). It includes tables and maps showing for the different crop reporting areas of the State the average prices received for different products and the percentage that such prices were of the State averages for the periods 1910–13, 1917–20, 1925–28, and 1931–34.

Ohio agricultural statistics, 1934, G. S. Ray, L. H. Wiland, and P. P. Wallrabenstein (*Ohio Sta. Bul. 554 (1935), pp. 52, fig. 1*).—This bulletin, prepared in cooperation with the Bureau of Agricultural Economics, U. S. D. A., continues the series previously noted (E. S. R., 72, p. 716). Included among other data are (1) preliminary county estimates, 1934, of the acreage, yield per acre, and total production of corn, winter wheat, oats, tame hay, and potatoes, and revised estimates for 1932 and 1933 for corn; (2) data by years as to acreages, yields, production, value, etc., of the above and other important field crops, hays, truck crops, etc.; (3) preliminary county estimates of the number of livestock on farms January 1, 1935, and for hogs revised estimates for January 1, 1933 and 1934, and for sheep for January 1, 1934; (4) data by years as to the number of head and value on January 1 of different kinds of livestock and five tables showing by years data as to farm prices of farm products, farm wages, gross cash income from sale of farm products, etc.

RURAL SOCIOLOGY

Migration of farm population and flow of farm wealth, F. R. Yoder and A. A. Smick (*Washington Sta. Bul. 315 (1935), pp. 24, figs. 2*).—This bulletin presents the findings of a study made in 4 townships of Whitman County on some phases of the relationship between the migration of people to and from farms and the flow of wealth to and from the country.

In the 4 townships studied in 1932 the average size of farms had been increasing steadily for 30 yr., as did the proportion of farm operators who were tenants and the reported value of land per acre and per farm. The purchasing power of land in farms declined, however, from 1910 to 1920 and still more sharply from 1920 to 1930.

The country population of Whitman County declined 24 percent between 1910 and 1930, while the population of 7 precincts, including the 4 townships surveyed, declined 17.6 percent during this period. Of the children who had left the farm homes in this area, 62.9 percent had left the 4 townships and 24.3 percent had left the State of Washington. More than two-thirds of these children had moved to cities, entering the professions, laboring, or clerical and business occupations.

More than one-half of the farm operators and their wives were born outside of the State. Eight of every 10 women and 9 of every 10 men were farm-reared. Only 15.9 percent of the farm operators were ever engaged in any nonfarming occupation. Of the 241 farm operators, 84.6 percent reported having some net worth at the time of their arrival, while 92 percent of the aggregate net worth was reported by operators who had moved from other farms.

Of 246 former landowners in the 4 townships, 74.8 percent lived in cities in 1932. These city-dwellers received 68.1 percent of the aggregate payments from present owners of the land.

Fewer than half of the owners of leased land had previously operated the land. One-third of the landowners were related by birth or by marriage to their tenants. Approximately one of each 10 landlords was reared in a city, but 67.5 percent of them lived in cities in 1932. The city-dwelling landlords received 77.5 percent of all rentals. Of the heirs to property in these 4 townships (1921–30), 80 percent resided in cities in 1932, while 32 percent lived in cities outside the State. Heirs living in cities inherited 82 percent of farm property passing through inheritance, while heirs living in the country inherited only 18 percent.

Status of town and village housing in Iowa, M. G. Reid (*Iowa Sta. Res. Bul. 186 (1935), pp. 49–173, figs. 41*).—In this bulletin are presented the results of a survey made of housing conditions in Iowa towns and villages having a population of less than 2,500. Information was obtained concerning 8,798 houses, 5,081 owner and 3,506 tenant homes in 10 typical agricultural counties and 211 homes in towns where mining is important.

The villages and towns studied are largely service and residence centers for farm communities. The proportion of people in business for themselves is relatively high while that of wage earners is low. Many of the heads of families are retired farmers or women without gainful occupation, and during the past decade, except in the case of larger towns, the population has been declining slightly.

Iowa village and town families own their homes more frequently than do those on farms or in cities. In 1930 the median value of owned homes was $2,739 and the median rent of tenant homes was $14.89 a month. Most of the families live in one-family dwellings no part of which is used for an office or commercial purposes, while about 5 percent live in dwellings connected with businesses or in dwellings for two or more families.

The houses are largely painted frame structures, only 7 percent being stucco, brick, stone, or concrete. One in 4 is one-story and 1 in 5 was built 50 or more years ago. Except in industrial towns very few houses have been built in the past 10 yr.

The houses average 6.4 rooms, but only 3 in 4 have a dining room and 2 in 5 a bathroom. Most houses needed some repair, and on only 28 percent was the paint reported as being in good condition. Approximately 6 percent of the houses needed replacement. Piped water was reported in only 2 in every 5 families and less than 1 in 3 had piped hot water. Sixty percent of the families carried water an average distance of 82 ft. Three in every 4 families either had a kitchen sink with drain or expressed a desire for one. Many of the towns have no sewage disposal system, and nearly 45 percent of the families disposed of all sewage on the surface.

About 88 percent of the families reported electric power line connections and 40 percent reported either ice or mechanical refrigeration. Gas or electric stoves for cooking were reported by only 13 percent, while kerosene or gasoline stoves were reported by 71 percent of the families. Nearly 2 in every 3 families had power washing machines. Most families had a garden including fruits and vegetables. Nearly two-thirds of the families had good lawns, but only 48 percent had good shade trees. Shrubs, flowers, and vines were relatively poor.

Tenant homes, including both houses and yards, were shabbier than those of owners and were not so well equipped with modern conveniences. The condition of the houses was not influenced by the size of town, but the better equipment was found in the homes of the larger towns.

On the average, professional families had better houses than any other occupational group. The larger the family the poorer the dwelling and the fewer the facilities. The older the houses the poorer their condition. In recent years brick has been used more commonly than in former years. Houses built during the past 10 yr. have fewer rooms and the proportion of modern facilities has increased. Laborers' houses, on the other hand, are relatively poorer in facilities than those built from 10 to 25 yr. ago.

Towns with an increasing population have houses in better condition than towns with decreasing population. Nonindustrial towns have better houses than industrial towns. The condition of town and village houses was much the same as that of farmhouses in the same counties.

Changes in the retail and service facilities of rural trade centers in Michigan, 1900 and 1930, C. R. Hoffer (*Michigan Sta. Spec. Bul. 261 (1935), pp. 36, figs. 5*).—The population data for 380 incorporated rural trade centers under 10,000 in population showed that from 1900 to 1930, 258 had an average decrease of 213 persons during this period. Declines in the population of a trade center were accompanied by a decline in the rural population of the surrounding area. Good roads favored the growth of trade centers. During the 30-yr. period the number of drug, furniture, notions or variety, and millinery stores decreased, while men's clothing establishments, shoe stores, grocery stores, and meat markets increased. These changes indicate increasing specialization among rural trade centers.

Among miscellaneous business services in the 380 trade centers over the 30-yr. period there was an increase in the number of plumbers, cleaning and dyeing establishments, and a slight increase in the number of bakeries, while laundries and blacksmith shops decreased. Local weekly newspapers were found in all groups of trade centers except in the group below 500 in population. Banks increased in number, although the percentage of towns below 1,000 in population with banks was smaller in 1930 than in 1920.

The number of trade centers under 500 in population having physicians decreased, but the average number of physicians per trade center indicated that most places having a population of 500 had at least one physician. Trade centers above 1,000 in population support at least one dentist.

Services rendered by unincorporated trade centers are supplementary to those offered by large trade centers, as the general store is the principal type of business agency in the unincorporated center.

County government costs in Pennsylvania, 1933, F. P. Weaver (*Pennsylvania Sta. Tech. Paper 688 (1935), pp. 16; abs. in Pennsylvania Sta. Bul. 320 (1935), pp. 9, 10*).—This mimeographed report supplements the bulletin previously noted (E. S. R., 70, p. 416). It includes data regarding expenditures in 1933 in the same 13 counties and makes comparisons with expenditures in 1913 and 1931.

FOODS—HUMAN NUTRITION

[Food studies by the Georgia Station] (*Georgia Sta. Rpt. 1935, pp. 30, 31*).—This progress report includes brief summaries of studies on the available iron in canned and dried turnip greens and collards, the vitamin A content of eggs from pimiento-fed hens and milk from pimiento-fed cows, and the vitamin G content of pimientos.

Cereals in nutrition today, F. L. Gunderson (*Cereal Chem., 12 (1935), No. 5, pp. 473–485, figs. 2*).—This paper, presented at the 1935 meeting of the American Association of Cereal Chemists, discusses the contribution of cereals to known dietary requirements with the following conclusions:

"Cereal grain foods continue to provide approximately a third of the energy and protein, a quarter of the phosphorus and iron, and very appreciable proportions of the total vitamin B content of nutritionally complete yet economical American dietaries. In such adequate menus as planned by dietetic experts for greatest economy, cereal foods are present to the extent of more than 0.5 lb. per adult per day. As one compares the nutritional economics of cereals with that of other classes of foods, it is readily apparent why cereals have long been called 'the backbone of the nutrition of most of the races of the earth.' There are many good reasons for expecting them to remain in that position."

Vegetables in the diet of tomorrow, S. L. Smith (*Veg. Growers Assoc. Amer. Ann. Rpt. 1934, pp. 68–92*).—This paper, presented at the 1934 meeting of the Vegetable Growers' Association of America, traces changing habits in vegetable consumption and the development of knowledge of the nutritional prperties of vegetables during the past 200 yr., and discusses the probable place of vegetables in the diet of the future.

"Perhaps it is not too rash to prophesy that the menus of tomorrow will be built around the protective foods: Milk, (possibly eggs) fruits, and vegetables; that through selection, breeding, and culture, the vegetables from which we make our choice will be somewhat richer in the essential minerals and vitamins than the common run of vegetables today; that through improved methods of manipulative treatment, these vegetables, whether we use them fresh or frozen, dried or canned, will retain more completely than at present the essentials which they have when freshly gathered; that they will be so standardized as to composition that their food value will be known within a reasonable range, thus making possible calculation of their exact contribution to the diet; and finally, that the cost of production and transportation will be so reduced that vegetables will be within the reach of all and yet yield a reasonable profit to producer."

Vegetables in the diet.—I, Yesterday. II, Today. III, Tomorrow, S. L. Smith (*Jour. Home Econ., 27 (1935), Nos. 2, pp. 73–77; 3, pp. 146–151; 4, pp. 218–222*).—Essentially noted above.

Iodine in Oklahoma vegetables, V. G. Heller and M. Jones (*Okla. Acad. Sci. Proc.* [*Okla. Univ.*], *15 (1935), p. 51*).—This contribution from the Oklahoma Experiment Station describes briefly a modification of the Remington and Karns method for determining iodine in dried vegetable material, and discusses in general terms the iodine content of Oklahoma vegetables on the basis of analyses of many samples of a large variety of vegetables grown in the State.

"The quantity of iodine found in Oklahoma vegetables equals, and in some cases surpasses, those reported from Carolina vegetables. The iodine seems to be more concentrated in those parts of the plant in which the green color is more intense. The quantity in the leaves surpasses that of the stems, while that found in the stems is greater, as a rule, than the amount present in the roots or tubers."

Chemical composition of canned peas of two varieties of different sizes and grades, W. S. Thompson and W. H. Peterson (*Jour. Agr. Res.* [*U. S.*], *51 (1935), No. 4, pp. 365–370, figs. 2*).—The canned peas used in this study at the Wisconsin Experiment Station were obtained from 4 canneries in various localities in the State. Of the 127 samples, 52 were of the Alaska or smooth variety in sizes of from 1 to 4, inclusive, and 75 of the sweet or wrinkled variety in sizes of 1 to 6, inclusive (with 1 lot of ungraded peas). The cans were of the No. 1 and No. 2 sizes. In each case the can and the contents were weighed, the liquor drained off, and the can reweighed. The can was then emptied of the drained peas and weighed again. The liquor and drained peas were combined and dried in a steam oven and then ground in an iron mill (except the samples used for iron determinations) to a fine powder. A composite sample was prepared by mixing equal portions of individual samples from 5 to 13 cans of each size.

The tabulated data presented include variations in quantity contained in the can and in dry matter of the canned product of the two varieties packed in No. 1 and No. 2 cans; the protein, phosphorus, and calcium content (wet basis) of different grades of both varieties from 1 cannery and composite samples from 4 canneries; and variations in composition of different grades of each variety (dry basis). The variations in the protein, calcium, phosphorus, crude fiber, iron, copper, and manganese content of different sizes of peas of both varieties are also shown graphically.

In any one size of peas there was only a small variation in the weight of the total contents of similar cans, but considerable variation in the proportion of liquor and peas. The iron, copper, and manganese content of the peas and liquor calculated on the wet basis increased with the size except the copper content of the Alaska variety, which showed a decrease.

The composition of peas from a single cannery was very similar to that of a composite sample from 4 canneries, showing that the variables which affect composition were practically the same for the different localities. No definite relation could be shown between grade and composition when all of the samples were taken from one size pea. In the Alaska variety the standard grade contained the largest amount and in the wrinkled variety the smallest amount of dry matter and of protein, but the other constituents were quite constant.

The composition and characteristics of soybeans, soybean flour, and soybean bread, L. H. Bailey, R. G. Capen, and J. A. LeClerc (*Cereal Chem., 12 (1935), No. 5, pp. 441–472, figs. 3*).—This extensive compilation of information on the soybean and its products includes original data obtained by the Bureau of Chemistry and Soils, U. S. D. A., on the chemical composition of soybeans in terms of minimum, maximum, and average values from hundreds of analyses; the minimum, maximum, and average percentages of fat and protein of a considerable number of samples of soybeans, largely of the same variety, grown under the general direction of W. J. Morse of the Bureau of Plant Industry, U. S. D. A., in different localities in the United States; the composition of various samples of soybean flour; and comparative analyses of soybean flours made from whole beans, from the press cake, and the solvent-extracted flour. The data on the soybeans are compared in various tables with data from the literature on other foods.

The text includes a discussion of acreage production and prices of soybeans in the United States, uses of soybeans, processes for the removal of the bitter taste, extraction of soybean oil, the nutritive value of soybean flour, and its use in baking.

"Soybean flour is a concentrated, wholesome, nourishing, and economical food. It is rich in protein, not only in quantity but also in quality. It is rich in fat, in minerals, and in most of the known vitamins. It is a cheap source of proteins, fat, minerals, and energy. It is alkaline in reaction. When mixed with wheat flour in any proportion not exceeding 20 percent of the mixture, it makes a most appetizing, attractive, and nourishing loaf of bread."

An extensive list of literature references is appended.

The nutritive value of the protein of cabbage and of sweet potato, H. C. Kao, W. H. Adolph, and H. C. Liu (*Chinese Jour. Physiol., 9 (1935), No. 2, pp. 141–148*).—Data are reported on the biological values, as determined by the nitrogen balance method of Mitchell and the growth method of Osborne, Mendel, and Ferry, of the extracted proteins of Chinese cabbage (*Brassica pekinensis*) and sweetpotato (*Ipomoea batatas*), both fed at a 10 percent level.

The values obtained by the Mitchell method were high for both proteins, 76 for the cabbage and 72 for the sweetpotato protein. With both proteins growth was slower than on casein at the same level.

Determinations of the nutritionally important amino acids in the two proteins were also made and indicate values for the cabbage protein similar to those reported by Chibnall (E. S. R., 52, p. 708) for spinacin, another green leaf protein, and for the sweetpotato protein values corresponding quite closely with those of Jones and Gersdorff (E. S. R., 67, p. 3) for ipomoein.

The nutritive value of fungi, II, III, H. J. Gorcica, W. H. Peterson, and H. Steenbock (*Jour. Nutr., 9 (1935), No. 6, pp. 691–700, figs. 4; pp. 701–714, figs. 5*).—Two papers are presented.

II. *The vitamin B, G, and B_4 content of the mycelium of Aspergillus sydowi.*—In a previous report[5] it was shown that the dried mycelium of *A. fischeri* and *A. sydowi*, when fed to young rats at a 20 percent level, furnished sufficient vitamin B to promote good growth and afford complete protection against polyneuritis. This paper reports an extension of the investigation to determine more accurately the content of the vitamin B complex and later the presence of various members of the complex in mold mycelium. Rats were used as experimental animals in the early part of the study and chicks in the latter part. The mold used was *A. sydowi*, grown for 10 days under aseptic conditions on a sterilized medium and preserved in frozen storage after removal from the medium and washing. The mold was removed from storage in the amount needed for a week's feed, ground to a fine paste, and incorporated wet in the ration, which was stored until used in tightly closed containers in an electric refrigerator.

It was found that 20 percent mold (dry basis) in the diet, yielding 1.5 g of mold daily, furnished enough vitamin B to support good growth in young rats, and that 10 percent, or 0.75 g daily, was almost as effective in promoting growth but did not supply quite as great a stimulus to the appetite.

The technic and rations in the chick experiments were the same as described by Kline et al. (E. S. R., 69, p. 844). In the vitamin B_1 experiments, mold at a 10 percent level furnished nearly enough of the vitamin to protect the chicks against polyneuritis and at a 20 percent level furnished complete protection against polyneuritis and promoted growth at a normal rate. In the G experiments, complete protection against pellagra but unsatisfactory growth was secured at a 1 percent level and good growth at a 3 percent level. As a source of vitamin B_4 a level of 30 percent of the ration was required for both growth and prevention of paralysis.

III. *The growth of rats on supplemented and unsupplemented mold proteins.*—In this study *A. sydowi* was tested for the nutritive value of its proteins by feeding it to rats as the sole source of protein in a diet consisting of 50 parts of mold (dry basis), 44 parts of cooked cornstarch, 4 parts of Steenbock and Nelson salt mixture No. 40, and 2 parts of cod-liver oil. In other experiments various proteins or amino acid supplements were substituted for part of the starch. In the latter experiments the food intake of the animals receiving the protein supplements was adjusted to that of the animals receiving only mold proteins.

The animals receiving the mold as the sole source of protein grew only slightly and died within 7 or 8 weeks. Of the various supplements, the most effective proved to be the proteins of whole wheat and corn gluten feed, which supported very good growth when added to the basal ration at either a 2½ or a 5 percent level. From the various combinations tested it is concluded that the mold protein is not deficient in lysine or tryptophan nor markedly deficient in cystine or tyrosine, but is deficient in histidine. Histidine alone, however, did not support continued growth.

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[5] Biochem. Ztschr., 267 (1933), No. 1–3, pp. 169–178, figs. 5.

Nutrition and the future of man, J. S. McLester (*Jour. Amer. Med. Assoc., 104 (1935), No. 24, pp. 2144–2147*).—In this presidential address delivered before the American Medical Association, June 11, 1935, the author discusses the question, "Can man, by giving thought to the food he eats, influence the destiny of his race?" Observations from the literature on the improvement of racial stock of experimental animals and on the improvement in nutritional condition and growth of children as the result of superior diet are noted. The teacher, physician, publicist, economist, and lawmaker are all considered essential in attempts to improve the nutrition of mankind. In regard to the political implications, the statement is made that "it must be recognized that any plan that proposes to elevate racial standards by means of improved nutrition must give serious consideration to political and economic factors, for in the carrying out of such a plan food must be produced in adequate amounts and marketed at a price that the public can pay."

Relation of diet to health, A. F. Morgan (*Jour. Amer. Dental Assoc., 22 (1935), No. 9, pp. 1465–1477, figs. 9*).—In this paper, presented as one of the 1934 popular lectures offered by the Stanford University School of Medicine, the subject is discussed under three headings: "(1) Diseases produced by faulty nutrition and treated chiefly or solely by changes in the diet; (2) diseases of unknown cause which are alleviated or cured by dietetic treatment; and (3) some indications of possible positive improvement through nutrition in physical development and maintenance of health beyond that now considered adequate."

Many references to the literature, including the author's own investigations, are given as footnotes.

The foundations of diet therapy, L. H. Newburgh (*Jour. Amer. Med. Assoc., 105 (1935), No. 13, pp. 1034–1037*).—This paper is essentially a plea to the physician to put diet therapy on a rational basis through knowledge of the quality and quantity of the constituents of the normal diet and of the effects of various diseases on these requirements. The water requirement of the body in health and the quantitative aspects of the loss of water in health and in certain diseases are discussed at considerable length in illustration of one of the dietary essentials frequently overlooked with disastrous results. The investigations of the author and his associates (E. S. R., 65, p. 793) demonstrating that the energy relations of normal men apply in detail to all obese persons are also discussed.

Further observations on the growth and reproduction of vegetarian rats on omnivorous diet, S. Wan and H. Wu (*Chinese Jour. Physiol., 9 (1935), No. 2, pp. 119–123, figs. 2*).—In continuation of the extensive comparison of vegetarian and omnivorous diets (E. S. R., 71, p. 882), an earlier study of the effects upon growth and reproduction of rats on changing from a vegetarian to an omnivorous diet (E. S. R., 65, p. 692) was extended to observations of the effect of this change on young rats with a vegetarian ancestry of 10 or 11 generations. The study was continued into the third generation.

In spite of the long continuation on the vegetarian diet, the growth and reproduction records showed marked improvement in the first generation. In the second generation the records were comparable in their way with those of stock animals. "These observations exclude the possibility of any hereditary difference, due to unintentional selection, between the omnivorous and vegetarian rats and further confirm our conclusion that the difference in growth and reproduction between the two groups of rats is solely due to the difference in diet."

Animal vs. vegetable protein (*Jour. Amer. Med. Assoc., 105 (1935), No. 6, p. 438*).—This is an editorial discussion of the studies of Wu and associates noted above.

Physical measurement of vegetarian and omnivorous rats, S. WAN and H. WU (*Chinese Jour. Physiol., 9 (1935), No. 2, pp. 165–188, fig. 1*).—In continuation of the comparison of the sizes of vegetarian and omnivorous rats (E. S. R., 65, p. 691), 173 rats on the authors' stock omnivorous diet and 211 on their vegetarian diet, the latter group having a vegetarian ancestry of from 11 to 14 generations, were sacrificed at different ages and the weights and lengths of various organs determined.

On the basis of equal body weight, the organs (except the kidney, liver, spleen, and testes) of the vegetarian animals were generally heavier and longer than those of the omnivorous rats, the difference being statistically significant. The thyroid glands of the vegetarian rats were about three times heavier than those of the omnivorous rats. The addition of iodine to the vegetarian diet of a group of 4-week-old rats prevented increases in the size of the thyroids, but had no effect on growth or on the weights of the other organs, thus indicating that the poor growth of the vegetarian rats is not due to lack of iodine.

Infant feeding, G. F. POWERS (*Jour. Amer. Med. Assoc., 105 (1935), No. 10, pp. 753–761, figs. 2*).—This paper discusses the historical background and modern practice of infant feeding. The historical summary consists of a brief outline of the chemical, pathological, bacteriological, metabolic, clinical, and vitamin studies which have formed the basis of the formulation of the infant diet of the present time. The present era is considered to be dominated by the concept of the "beneficence of 'enough' of food constituents in contrast to that of the past of the harmfulness of 'too much' or 'too little.'" The more important items in the construction of the infant dietary at the present time are discussed at varying length. These include energy requirement, the calorie in the assessment of milk mixtures, and the requirements of protein, fat, carbohydrate, vitamins, water, and salts. The various conceptions and rules for devising formulas for satisfactory milk mixtures are reviewed, and the downward trend in infant mortality is discussed, with suggestions for problems in artificial feeding which still require investigation.

The immediate future in infant feeding is considered to be the psychologic era in which the "pediatrician must think not less in terms of principles of nutrition but definitely and decidedly also in terms of the personality of the child and of those in his immediate environment, especially, of course, of the mother." The psychologic factors which play a minor role in breast feeding and a major role in artificial feeding are discussed at considerable length, with the conclusion that "the most important aspect of the emotional problem in infant feeding is recognition that the problem exists and to a large degree may be prevented if the physician has insight and understanding of the personality of the mother and takes pains to prepare her to meet situations that are bound to occur in every case. The physician may need the assistance of a psychologist or a psychiatrist, or both, in therapy, but the burden of prevention is wholly that of the physician who guides the feeding."

The use of milk, fruit, and vegetables in the diet of rural Rhode Island school children, B. M. KUSCHKE and M. WHITTEMORE (*Rhode Island Sta. Bul. 253 (1935), pp. 18*).—This study was undertaken to determine the amounts of protective foods—milk, fruit, and vegetables—consumed by apparently healthy rural Rhode Island school children and the cost of providing these protective foods at the time of study, 1933–34.

Three sections of the State were selected for the study and as nearly normal and average children were chosen in each locality as could be determined by general observation and information. Records were kept by 90 mothers of the quantities of milk, fruit, and vegetables used for 1 week by one or more school children in their families. Records for 1 week were obtained for 106 children and a second record at another season of the year for 69 of the same children. The records were fairly evenly divided among the 4 seasons. Data were obtained during the course of the study on the children's height, weight, and school attendance, the occupation and income of the father (or mother), education of the mother, location of the home with reference to stores, and the extent of food production and preservation in the home. In analyzing the data the food records were graded by use of the score card prepared by the extension nutrition committee of the American Home Economics Association. The food costs were computed from averages obtained from the Providence Retail Price Report issued weekly and from price lists obtained from 2 large chain stores.

The consumption of milk ranged from ⅝ to 8 cups (8 oz.) per day, with an average of 3.5 cups. More than one-third of the whole group, however, received less than 3 cups per day. Fruits and vegetables were served about equally, the average being 2.5 servings of vegetables and 2.4 servings of fruit daily, with a leafy green vegetable about 5 times a week. Nearly one-third of the entire number had less than 2 servings of vegetables a day, including potatoes. The amount of fruit used was considered more satisfactory.

The report contains a list of all of the fruits and vegetables served and the number of times each appeared in the entire 175 records. Of the fruits, apples headed the list with 838 times served, followed by oranges 633, bananas 439, peaches 139, prunes 136, and grapefruit 101, with 18 other fruits and berries appearing less than 100 times. Of the vegetables, potatoes headed the list with 1,114 times served, followed by tomatoes 304, carrots 289, lettuce 242, spinach 207, green beans 187, peas 168, cabbage 134, and beets 108, with 11 others below 100.

The average number of calories furnished per person daily by the 3 groups was 587 from milk, 238 from fruit, and 167 from vegetables. The 3 groups together furnished an average of 1.16 g of calcium, 1.018 g of phosphorus, and 0.00672 g of iron daily. The average cost was 18.5 ct. per day distributed as milk 10 ct., fruit 5, and vegetables 3.5 ct. Considerable variation was shown in the cost of the protective foods consumed. Two diets with protective foods at less than 50 ct. a week rated very low. In general, with increasing cost the quality improved. However, an adequate supply of the protective foods was furnished in 17 records on the small sum of 50 ct. to $1 a week.

Factors promoting positive health in school children, A. P. Brown (*Utah Sta. Bul. 257* (*1935*), *pp. 48, figs. 2*).—In an effort to learn why some children in a group are more healthy than others, inquiry was made into the history of the care given to 52 rural school children from 8 to 15 yr. of age. On the basis of physical and dental examinations, the children were divided into a more healthy, and a less healthy group of 26 each. The data secured for the purpose of comparing these groups included the dietary histories of the mothers during pregnancy and of the children in infancy and early childhood; the nature of the present diet of the children, as shown by a 3-day quantitative study; the health history, as shown by the physical development and activities of the child and family health trends; and environmental factors, including community facilities and home conditions for health and sanitation, family business, and social and domestic conditions.

No dramatic differences in health history or nutrition between the two groups were discovered. "There were, however, some small but consistent differences brought out, no one of great significance by itself, but which in the aggregate may influence physical well-being." Several dietary, health, and environmental factors which are thought to have played some part in promoting a better state of health in the children of the more healthy group are listed. The dietary factors include a slightly better prenatal diet, better conditions of breast feeding, earlier additions to the infant diet of mineral and vitamin-containing foods, and a higher content in the present diet of iron, vitamin A, and the B vitamins.

Body build factor in the basal metabolism of boys, M. Molitch (*Amer. Jour. Diseases Children, 50 (1935), No. 3, pp. 621–625*).—No correlation was found between the body build (width-height indexes) and oxygen consumption of a group of 199 boys ranging in age from 10 to 18 yr., the greater number being between 14 and 16 yr. The data reported include variation in the number of apubertal, pubescent, and pubertal boys in each age group from 10 to 18 yr., inclusive; the range of width-height indexes and basal metabolic rates of the two extremes in each age group from 10 to 16 yr.; the quartile averages in calories per square meter and per kilogram per hour for each age group from 12 to 16 yr.; and the oxygen consumption by age groups from 9 to 16 yr., inclusive.

Cataract in rats fed on high lactose rations, H. S. Mitchell and W. M. Dodge (*Jour. Nutr., 9 (1935), No. 1, pp. 37–49, figs. 2*).—This paper reports the production of mature or markedly advanced cataracts in all rats fed a synthetic laboratory diet in which excessively high levels of lactose constituted the sole source of carbohydrate, and the complete absence of cataract in control animals fed similar rations except for the substitution of starch, maltose, dextrin, or sucrose for the lactose. The diets consisted of carbohydrate 70, casein 15, Osborne and Mendel salt mixture 5, Crisco 9, and cod-liver oil 2 parts fed ad libitum, with 0.5 g of dried brewer's yeast fed separately. Increasing the yeast to 2 g daily did not prevent the onset of cataract, nor could the cataract be attributed to some unknown contaminant of the lactose, as it was produced on chemically pure as well as on commercial lactose.

Weekly ophthalmoscope examinations during the development of the cataract led to the detection of the earliest changes from one to several weeks before distinct opacities were observed with the naked eye. The first step in one type of cataract was a zone of defraction or fine line in the lens around the periphery. The second step consisted of an increase in the size, width, and density of this zone, followed by complete opacity of the nucleus. A second form of lens change consisted in a cortical opacity located under the anterior lens capsule. Several of these may appear simultaneously, progressing and coalescing to complete opacity. A third form consisted of a combination of the first two types. Histological preparations showed normal microscopic appearance of the cornea, sclera, ciliary bodies, and retina, the only evidence of a pathological condition being in the lens itself. Cataracts also developed at lower levels of lactose, the time required for appearance of the first signs increasing with decreasing content of lactose.

Blood, urine, and tissue analyses on a limited number of animals indicated a disturbance in both carbohydrate and mineral metabolism, with a loss of galactose in the urine and a marked increase in calcium and decrease in potassium, with some alteration in the proportions of other inorganic constituents in the lens. The total and diffusible calcium content of the blood was not altered significantly.

The authors conclude that "the possibility of producing or controlling the development of cataract in lower animals by dietary means promises to be a valuable device for further and more detailed study of the etiology of cataract."

Cataract formation in rats fed on a diet containing galactose, A. M. Yudkin and C. H. Arnold (*Soc. Expt. Biol. and Med. Proc.*, *32* (*1935*), *No. 6*, *pp. 836, 837*).—The authors have corroborated the above-noted findings of Mitchell and Dodge on the occurrence of cataracts in the eyes of rats fed a high lactose diet, and have also demonstrated the production of cataracts in young and adult rats on a diet consisting of galactose 50 percent, cornstarch 20, casein 15, Crisco 9, Osborne and Mendel salt mixture 4, and cod-liver oil 2 percent, with 5 drops of cod-liver oil and 0.5 g of dried yeast powder fed separately each day.

On this diet rats 21 days of age grew well and appeared well nourished, but in 12 or 14 days changes developed in the nucleus of the lens. Six animals killed on the appearance of lens changes showed no gross pathological symptoms. The other 2 at the end of 7 weeks had matured cataracts in both eyes, but showed no deficiency symptoms or gastro-intestinal disturbances. In 2 rats placed on the high galactose diet at the ages of 64 and 2 of 78 days, changes appeared in the periphery from the eighteenth to the twenty-third day, later extending to the nucleus. No gross pathological changes were noted, but the urine showed marked reduction of Benedict's reagent.

The authors conclude that galactose interferes with the metabolism of the lens, the changes taking place in the growing areas of the tissue, which in the young rat is the nucleus and in the adult rat the periphery of the lens.

Cataract in rats fed on galactose, H. S. Mitchell (*Soc. Expt. Biol. and Med. Proc.*, *32* (*1935*), *No. 6*, *pp. 971–973*).—Galactose was fed to young rats at 35 and 25 percent levels, corresponding to the galactose available from the 70 and 50 percent lactose rations fed in the investigation of Mitchell and Dodge noted above.

Four rats on the 35 percent galactose ration developed mature bilateral cataract in from 12 to 37 days (averaging 19 days). On the 25 percent galactose ration, cataract also developed but after a longer period. Attention is called to the fact that the average time for development of mature bilateral cataract on the 70 percent lactose ration of the earlier study was from 4 to 10 weeks, or approximately 4 times as long as with galactose.

Growth was subnormal on both galactose and lactose, but diarrhea, which invariably resulted from lactose feeding, did not occur on galactose. The calcium content of the cataractous eyes was of the same magnitude on the two sugars, although the increase took place more rapidly in the rats fed galactose and was from 3 to 4 times as high as that of the normal eyes of rats on a diet containing 70 percent of starch.

In discussing the cause of cataract, the author suggests a disturbance of the colloidal equilibrium in the crystalline lens by changes in inorganic ions. "It would seem that the perfect transparency of the normal lens must be maintained by an extremely constant balance of inorganic ions, and that any interference with the inorganic equilibrium might disturb the colloidal solution and cause some of the proteins of the lens to precipitate."

Gastrointestinal pH in rats as determined by the glass electrode, I. M. Eastman and E. G. Miller, Jr. (*Jour. Biol. Chem.*, *110* (*1935*), *No. 1*, *pp. 255–262*).—Preliminary to the selection of the glass electrode for this study, many parallel determinations were made with glass, hydrogen, and quinhydrone electrodes and by colorimetry. While comparable results were obtained with all of the methods on standard buffer solutions, the intestinal contents gave higher readings with colorimetric methods, occasional inconsistent results with the quinhydrone electrode due to drift in potential, and unsatisfactory results with the hydrogen electrode because of rapid poisoning of the electrode.

The data reported consist of pH determinations with the glass electrode of the contents of the gastro-intestinal tracts at six levels in young (156) and adult (299) rats fed various diets ad libitum, including normal diets, diets low in protein, carbohydrate, or fat, and rickets-producing diets with or without cod-liver oil.

On normal diets both young and adult rats showed an acid reaction throughout the entire length of the digestive tract, with the pH rising from the stomach to the ileocecal valve, falling in the cecum and again rising in the colon. The young rats showed a tendency to a higher pH throughout the tract than did the adult rats.

Ten percent added lard did not produce any change from the normal, but in animals receiving diets containing 30 percent lard the whole tract was from 0.5 to 0.7 pH more acid than normal. In animals on a bread diet there was a tendency for the contents of the colon to be more acid than that of the cecum. Adult animals fed boiled potatoes or lean meat showed an acid reaction throughout the entire tract. In both young and old rats on rachitic diets the normal changes throughout the length of the tract were shown, except that the average pH values for each level were somewhat higher. Following the addition of cod-liver oil to the McCollum rickets-producing diet, the pH values showed a tendency to return to normal.

In following the data for individual rats, it was concluded that the pH value at a given level of the intestine is determined by local conditions of absorption, secretion, and bacterial action rather than by the pH at higher levels.

Studies on capillary fragility: A device for the study of capillary hemorrhage, I. S. Cutter and C. A. Johnson (*Jour. Amer. Med. Assoc., 105 (1935), No. 7, pp. 505, 506, figs. 2*).—A compact portable apparatus for determining capillary fragility by the suction or negative pressure method is described and illustrated, with directions for its use.

"Results thus far obtained with this instrument indicate that it has a wide field of usefulness in the study of the peripheral vascular bed, with particular reference to the factors underlying capillary hemorrhage."

Chemical and physical properties of haddock-liver oil and its vitamin content, S. R. Pottinger, C. F. Lee, C. D. Tolle, and R. W. Harrison (*U. S. Dept. Com., Bur. Fisheries, Invest. Rpt., No. 27 (1935), pp. II+16, figs. 6*).—Various samples of haddock-liver oil from fish caught in the important fishing grounds off New England and Canada were analyzed for chemical and physical properties to determine whether or not they met the U. S. P. standards for cod-liver oil, and were tested biologically for vitamins A and D.

The data obtained show that "haddock-liver oil, especially from Georges Bank fish, will in many cases exceed the maximum limit for iodine number prescribed in the United States Pharmacopoeia for U. S. P. cod-liver oil. The various oils tested in most cases were found to carry less vitamins A and D than cod-liver oil, many being only about half as potent. Oil from Georges Bank fish was found to be among the poorest. In view of this information, it is evident that pure haddock-liver oil will not in all cases meet U. S. P. requirements."

Vitamins in frozen milk, L. Ascham (*Ice and Refrig., 87 (1934), No. 6, p. 321*).—In this contribution from the Georgia Experiment Station data are summarized leading to the conclusion that "milk frozen by the quick-frozen method and tested after being stored for 4 mo. and 2 yr., respectively, shows no significant lowering of vitamin A or vitamin G content over that found in fresh milk from the same source."

The vitamin A and C content of frozen blackberries, E. L. BATCHELDER, K. MILLER, N. SEVALS, and L. STARLING (*Jour. Amer. Dietet. Assoc., 11 (1935), No. 2, pp. 115–118*).—The frozen blackberries used in this study were from the 1932 and 1933 pack of the Puyallup and Sumner Fruit Growers Association, Puyallup, Wash. In the procedure followed, berries picked during the day were delivered to the cannery between 4 and 7 p. m., run through a washer and over a sorting belt, and placed in 30-lb. containers in storage at from 0° to 5° F. by 10 p. m. After 24 or 48 hr. the cans were removed to holding rooms at a temperature of about 15° and were kept at this temperature until used, the samples for feeding being weighed while the berries were still in the frozen state. The vitamin A determinations were made by the procedure of Sherman and Munsell and the C determinations by that of Sherman, LaMer, and Campbell, both with slight modifications which are described.

In the vitamin A tests the feeding of the frozen berries at levels of 0.4 and 0.5 g daily brought about average weekly gains during a 5-week period of 3.3 and 5.5 g, respectively. In the C tests the berries were fed at daily levels of 10, 14, and 18 g for 8 weeks, with resulting average daily gains of −0.3, 2.5, and 3.7 g, respectively, and corresponding scurvy scores of 18, 3, and 0.4.

"It is concluded that frozen blackberries contain 2.5 Sherman units of vitamin A per gram or 71 units per ounce, and 0.06 unit of vitamin C per gram or 1.6 units per ounce. Blackberries may, therefore, be considered as a relatively good (though not outstanding) source of vitamin A, and as a relatively poor (though not entirely deficient) source of vitamin C."

Shotgun vitamin therapy, P. N. LEECH (*Jour. Amer. Med. Assoc., 105 (1935), No. 13, pp. 1037, 1038*).—Under this title the Council on Pharmacy and Chemistry of the American Medical Association reviews briefly the present status of mixed vitamin therapy, and calls attention to the evidence pointing to the incompatibility of various vitamins, their possible deterioration when prepared in concentrates and mixtures, and the lack of a sound basis for fixing the relative ratios of various vitamin ingredients in such mixtures. "The council, therefore, will not accept mixtures containing vitamin concentrates until the manufacturers are able to present adequate evidence of their rationality. This does not refer, however, to concentrates of vitamin A and D, which occur combined in nature as such in cod-liver oil, nor does it apply to any combinations of vitamins that may occur in nature in therapeutic amounts."

The effect of early vitamin depletion on the capacity of animals to grow and develop during later life, W. D. GALLUP (*Okla. Acad. Sci. Proc. [Okla. Univ.], 15 (1935), p. 58*).—In this study at the Oklahoma Experiment Station albino rats of the same sex and age and approximately the same size were divided into groups of 3, in each of which 1 animal was given ad libitum a diet deficient in either vitamin A or vitamin B, another the same diet in the amounts voluntarily eaten by the first but supplemented with the lacking vitamin, and the third the same diet as the second but ad libitum. After a period of 3 or 4 weeks the lacking vitamin was added to the diet of the first animal in each group, and all 3 were allowed to eat ad libitum. After a few weeks all of the animals were transferred to stock diet and observed for several months.

Losses in weight which occurred in the animals on the restricted diets were checked and growth was resumed at a fairly constant rate after the lacking vitamin had been restored and the animals were allowed to eat ad libitum. In the longer period after return to the stock diet, the animals which had lost weight regained it at a more rapid rate than normal. The males for the most part attained normal size and weight for age. The females were able to reproduce and raise their young, although some remained undersized and appeared more susceptible to infections of the nasal tract.

"The results indicate that in most instances avitaminosis produced by withholding either vitamin A or B over a reasonable period of time has little influence on the capacity of animals to grow and develop during later life."

A modification of Sherman and Smith's vitamin A deficient ration for rats, H. C. Hou (*Chinese Jour. Physiol. 9 (1935), No. 2, pp. 197–205, figs. 3*).—With a view to the use of local materials as substitutes for the more expensive ingredients in the Sherman vitamin A-deficient diet, alcohol-extracted soybean protein was tested as a substitute for casein and native potato starch for cornstarch in separate experiments. A dried yeast of local manufacture was used as the source of the B vitamins and Ostelin dissolved in 85 percent glycerin as a source of vitamin D.

Rats on the soybean protein ration showed a somewhat shorter depletion period and slightly greater increase in weight during the test period than the control group on the Sherman diet. Those on the potato starch ration had the shortest depletion period and the best gains in body weight during the test period. It is thought that even better results may be possible by using a ration containing both soybean protein and the potato starch in place of casein and cornstarch.

The use of polarized light in the study of myelin degeneration.—II, The degeneration of myelinated nerves in avitaminosis A in the white rat, H. E. SETTERFIELD and T. S. SUTTON (*Jour. Nutr., 9 (1935), No. 6, pp. 645–655, figs. 4*).—Essentially noted from another source (E. S. R., 73, p. 134).

The effect of vitamin A upon incidence and severity of colds among students, H. C. CAMERON (*Jour. Amer. Dietet. Assoc., 11 (1935), No. 3, pp. 189–204, figs. 3*).—This contribution from the West Virginia Experiment Station consists of the complete report of a 2-yr. investigation of the effect of vitamin A therapy on the number and duration of colds among groups of students and faculty at the university. The general plan of the investigation and the materials tested during the first year have been noted from a preliminary report (E. S. R., 72, p. 137). The subjects in the second year included about half of the group of women students of the first year and in addition a group of second-year medical students (chiefly men) and additional men and women students and faculty, making a total number of subjects for whom records were obtained of over 200. Haliver oil was included in the test the second year, and salad oil was given to a few as a control group. The dosage of cod-liver oil was reduced to 2 teaspoonfuls daily, and the dosages of the other materials were adjusted accordingly.

Examination of all the records showed that the vitamin A treatment in the form of cod-liver oil, haliver oil, and carotene had little or no effect in reducing the average number of colds. The average duration of colds, however, was reduced by from 5 to 10 days per subject, the difference being statistically significant. Approximately 60 percent of the subjects receiving treatment showed improvement in the number or duration of colds, and approximately 50 percent reported improvement in endurance, sense of well-being, appetite, or skin eruptions.

In order to determine the contribution made by the diet to the vitamin A intake, each student taking part in the study was asked to note in the weekly colds record the number of servings eaten during the week of such vitamin A-rich foods as liver, eggs, cheese, cream, spinach, peas, tomatoes, sweetpotatoes, and carrots, and from these records calculations were made of the vitamin A content of the diet for 1 week of each month during the first half year and the averages of the weekly figures reduced to a daily basis. These figures, exclusive of milk, varied from 1,450 to 10,000, with an average of 4,327 vitamin A units daily. The majority of the figures fell between 3,000 and 8,000, with 90 percent over 3,000. Milk furnished an additional average amount of 952 units daily.

For a group of 9 girls the dormitory diet was enriched with about 5,000 units of vitamin A by special foods from December 1 to March 25. The average number of colds for this group, estimated to receive about 7,000 units of vitamin A daily, was 1.8, or about the same as the average of the group receiving vitamin A medication. The average number of colds-days per girl, 12.7, was also close to that of the treated group.

The author concludes from the results of this investigation and a critical review of the literature, 44 references to which are appended, that "vitamin A is a factor in reducing somewhat the severity and duration of colds in young adults, although not a specific against colds and not to be considered a cure for a cold."

Vitamin A and the common cold, H. C. CAMERON (*Med. Woman's Jour., 42 (1935), No. 10, pp. 266–270*).—In this paper the more clinical aspects of the relation of vitamin A to the common cold are discussed in reporting the investigation noted above, with the conclusion that "whether the effect of vitamin A upon colds, therefore, rests upon its ability to maintain intact a barrier of healthy mucous membrane to act as a local defense against invasion by virus or bacteria, or whether its effect is due also to its influence on circulation and nervous mechanisms which vitamin A is known to have and in which weather and dietary imbalance undoubtedly play a part, it has been shown to be a factor in the duration of colds in adults and worth a trial in all susceptible individuals."

The vitamin B content of raw pinto beans, M. L. GREENWOOD (*New Mexico Sta. Bul. 232 (1935), pp. 19, figs. 9*).—The first part of this bulletin consists of the complete report of a study of the vitamin B_1 content of raw pinto beans, a part of the extensive investigation of the nutritive value of this important food crop of the State (E. S. R., 74, p. 123). This is followed by a discussion of the relation of vitamin B_1 to health and nutrition and of the relative content of this vitamin in various common foods.

The vitamin B_1 value of the dry raw pinto bean is estimated to be approximately 10.5 Sherman units per gram, or 4,775 units per pound. "Raw pinto beans are thus found to be an excellent source of vitamin B." The graded response of rats to increasing doses of vitamin B given as raw pinto beans is shown by the average curves of gains in weight on the different doses and by photographs of animals of the same litter fed the graded doses and chloroformed at the end of 4 weeks.

The effect of the type of carbohydrate on the synthesis of the B vitamins in the digestive tract of the rat, N. B. GUERRANT, R. A. DUTCHER, and L. F. TOMEY (*Jour. Biol. Chem., 110 (1935), No. 1, pp. 233–243, figs. 3; abs. in Pennsylvania Sta. Bul. 320 (1935), pp. 8, 9*).—Additional data are reported concerning the effect of diets containing dextrinized cornstarch and sucrose on the synthesis of the B vitamins in the digestive tract of the rat (E. S. R., 71, p. 727) and new data on lactose, glucose, and commercial cornstarch. The same methods were followed as in the earlier studies.

The earlier conclusion that the vitiating effect of coprophagy in vitamin B determinations is much greater when dextrinized cornstarch is used as the carbohydrate than with sucrose was confirmed, and this was also shown to be true in comparison with lactose, glucose, and commercial cornstarch. Lactose, however, appeared to occupy a somewhat intermediate position between dextrin and sucrose.

From cultures of the feces of animals on the sucrose and dextrin diets and from feeding tests in which the contents of various portions of the digestive tract of rats on the two diets were given as vitamin B (complex) supplements, suggestive, although not absolutely conclusive, evidence was obtained that the "peculiar property of the dextrinized cornstarch is not due to the retained B vitamins, but rather to the formation of these vitamins in the lower part of the digestive tract of the rat, as a result of the incomplete digestion of this particular form of carbohydrate. This dietary elaboration apparently takes place in the cecum of dextrin-fed rats. Since live yeast cells were found to exist in the cecum of such rats in enormous numbers, these micro-organisms are believed to be the specific agents of elaboration of the B vitamins."

Studies of the rate of digestion and absorption during avitaminosis B and G, R. Reder and W. D. Gallup (*Okla. Acad. Sci. Proc.* [*Okla. Univ.*], *15* (*1935*), *pp. 58–61, fig. 1*).—The method followed in this investigation at the Oklahoma Experiment Station was similar to one outlined by C. F. Cori[6] for studying the rate of absorption of various sugars. Albino rats approximately 2½ mo. old and of approximately uniform size were given a basal diet devoid of the B vitamins until depleted of their stock of these vitamins, and were then divided into five groups. The first of these continued on the deficient diet, three others on the same amount of the diet as that consumed by the first group but with the addition of vitamin B, vitamin G, and a combination of B and G, respectively, a fifth group received vitamins B and G with the basal diet ad libitum, and a sixth a natural diet. After from 14 to 21 days, the animals were fasted 24 hr., after which, under light ether anesthesia, 1 cc of a suspension of a soluble starch was introduced directly into the stomach of each rat by a catheter tube attached to the needle of a 1-cc syringe. At the end of the period allowed for digestion and absorption, the animals were chloroformed and the contents of the gastrointestinal tract, after hydrolysis and suitable clarification, were used for determinations of glucose by the Bertrand method. For comparison similar determinations were made on a duplicate sample of the starch subjected to the same hydrolysis.

The normal controls digested and absorbed the starch at a more rapid rate than any of the other animals, although those on the basal diet supplemented with vitamins B and G and eating ad libitum showed only slightly slower rates. The animals depleted of both vitamins B and G showed a much slower rate of digestion and absorption, which was not corrected by the addition of vitamin B but was improved by vitamin G. Animals receiving vitamins B and G and allowed to eat ad libitum had a more rapid rate of digestion than similar animals on restricted food intake but with the same vitamin.

The authors conclude that both deprivation of vitamin G and restriction of food intake are responsible for the retardation in the rate of digestion and absorption of carbohydrate observed in animals deprived of both vitamins B and G.

The value of the chemical titration method in determining the vitamin C potency of certain food substances, N. B. Guerrant, R. A. Rasmussen, and R. A. Dutcher (*Jour. Nutr.*, *9* (*1935*), *No. 6*, *pp. 667–675; abs. in Pennsylvania Sta. Bul. 320* (*1935*), *p. 8*).—The 2,6-dichlorophenolindophenol method, using the technic of Bessey and King (E. S. R., 71, p. 137), was compared with the biological method, using the technic of Sherman, LaMer, and Campbell, on lemon, orange, grapefruit, and fresh and canned pineapple juices.

For all but the canned pineapple juice, the values obtained by chemical titration were in close agreement with those obtained biologically. One cc of orange juice was equivalent to about 7 cc of canned pineapple juice in the guinea pig tests, while the results of the titration gave a ratio of about 1:6.

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[6] Jour. Biol. Chem., 66 (1925), No. 2, pp. 691–715, fig. 1.

Titration data and calculated minimum protective dosages are also given for several other fruits and vegetables.

Value of commercially canned and laboratory-prepared tomato juices as antiscorbutics, C. R. Fellers, J. A. Clague, and P. D. Isham (*Jour. Home Econ.*, *27* (*1935*), *No. 7*, *pp. 447–451*).—In this contribution from the Massachusetts Experiment Station, data are reported on the average gains in weight, survival periods, and scurvy scores of guinea pigs on varying doses of commercially canned and home-canned tomato juices, representing for the commercial samples several brands and consecutive years of the same brand, and for the laboratory-canned homogenized and nonhomogenized juices of two varieties of tomatoes and samples for two consecutive years of one of the varieties. Other samples tested included tomato concentrates and the sieved juice of commercially canned and home-canned tomatoes.

Although the commercially canned tomato juices varied considerably in their vitamin C content, the protective dose ranging from 2 to 6 g daily, all but one were considered good sources of vitamin C. The brand which was judged best in color and flavor was consistently highest in vitamin C content, "but whether this correlation is true or merely apparent cannot be determined from such a small number of trials." Considerable annual variation occurred in the vitamin C content of samples of a single brand of juice.

Of the laboratory-canned samples, the juice of the Marglobe variety had a somewhat higher vitamin C content than that of the Stone variety. Homogenized samples were as rich as the nonhomogenized, and the sieved juices compared favorably with the best commercially canned juice. About 50 percent of the original vitamin C content of the juice was destroyed on concentrating the juice by open-kettle boiling, but the remaining puree, volume for volume, contained about the same amount of vitamin C as the original juice.

The antiscorbutic potency of commercial tomato-juice cocktails, D. M. Somers and M. D. Sweetman (*Jour. Home Econ.*, *27* (*1935*), *No. 7*, *pp. 452–454*, *fig. 1*).—Six lots of 5 guinea pigs each were fed a basal vitamin C-free ration alone and supplemented with 3 cc of freshly expressed orange juice, a commercial brand of tomato juice, and 3 commercial brands of tomato juice cocktail, respectively. None of the animals receiving either the orange juice or the tomato juice developed recognizable symptoms of scurvy, but growth was somewhat better on the orange juice than on the tomato juice. The cocktails varied greatly in their growth-promoting effect and protection against scurvy, although scurvy from mild to severe developed in all of the animals.

Misleading vitamin claims were made on the labels of two of the cocktails, leading the authors to state that "in view of the failure of recent attempts to secure more completeness and exactness in labeling, the implications of this study for the continuation of this movement by consumers and their home economist representatives are perhaps of even more importance than spreading the information about the inadequacy of these particular products."

Hemolytic action of cevitamic (ascorbic) acid, H. H. Anderson and C. D. Leake (*Jour. Amer. Med. Assoc.*, *105* (*1935*), *No. 13*, *p. 1033*).—It is noted briefly that concentrations of 1:1,000 or stronger of natural or synthetic cevitamic acid in physiological salt solution or water cause human blood cells to hemolyze at once and consequently are unsuitable for intravenous injection. No hemolysis occurs within 48 hr. with cevitamic acid in dilution of 1:5,000 or weaker of the acid in 0.9 percent NaCl solution or with 2 percent or less of sodium cevitamate dissolved in physiological salt solution.

"On the basis of these observations it is suggested that for intravenous use solutions of the sodium salt of cevitamic (ascorbic) acid approximate isotonicity, i. e., 1 percent of the salt dissolved in physiologic solution of sodium chloride or 3 percent in distilled water. If only the acid is available it should be neutralized with one-half its weight of sodium bicarbonate (sterile) in physiologic solution of sodium chloride or water before it is injected."

The treatment of milk allergy and its basic principles, B. Ratner (*Jour. Amer. Med. Assoc., 105 (1935), No. 12, pp. 934–938*).—This paper discusses, with references to the literature including reports by the author and his associates, the pathogenesis of milk allergy, the immunochemistry of milk proteins, and methods of treating and of preventing milk allergy.

"Hypersensitiveness or allergy to milk is of more frequent occurrence than is generally realized, and not only causes mild symptoms but may even result in acute anaphylactic death. It occurs in adult life as well as in infancy and childhood. The soluble whey proteins of raw cow's milk, lactalbumin and lactoglobulin, are most often responsible for this condition; casein plays a negligible role. The pathogenesis, which is accounted for on the basis of acquisition and not of inheritance, suggests preventive measures. The treatment consists in the elimination of raw milk from the diet, replacement of it by denatured milk, and the establishment of tolerance by the slow and gradual introduction of raw milk."

Nutritional iron-deficiency anaemia, L. S. P. Davidson, H. W. Fullerton, and R. M. Campbell (*Brit. Med. Jour., No. 3891 (1935), pp. 195–198, fig. 1*).—Hemoglobin values are reported by various age groups for approximately 3,500 individuals representing a cross-section of the poorest classes of the population in Aberdeen and the northeast of Scotland. The subjects were volunteers obtained at prenatal, mother, and child welfare clinics and dispensaries, or at schools and clubs. In a large proportion of the families the wage earner was unemployed at the time the studies were made. Hemoglobin was determined by the Haldane hemoglobinometer on which 100 percent is the equivalent of 13.8 g of hemoglobin per 100 cc of blood. In evaluating the data 86 percent was taken as normal for infants from 5 mo. to 2 yr. of age, 90 percent for children 2 to 5 yr., 95 percent for school children and adolescent females, 105 percent for adolescent and adult males, and 98 percent for adult females, with a range of normality in each case of ±10 percent.

As judged by these standards, anemia was found to be present in 41 percent of 507 infants, 32 percent of 58 preschool children, 2 percent of 44 school children, 16 percent of 246 adolescent women, and 45 percent of 1,584 adult women. It was absent in adolescent and adult males except in association with organic disease.

In only two periods of life was the anemia considered of clinical importance, in infants between the eleventh and twenty-third months and adult women. In the latter the incidence was highest in those of reproductive age who had borne children, particularly during the latter part of this period and in pregnancy. After the menopause there was a decrease in the prevalence of anemia. "The high incidence of anemia in women, in contrast with its absence in men of the same social status, is striking, and justifies the conclusion that the physiological demands for iron conditioned by pregnancy and menstruation are not satisfactorily supplied by the diets of many women of the poorest classes."

Hair-loss as effected by diet, with particular reference to the effect of gossypol, R. E. REDER and W. D. GALLUP (*Okla. Acad. Sci. Proc. [Okla. Univ.], 15 (1935), pp. 52–54*).—In this contribution from the Oklahoma Experiment Station, a study of the causes of loss of hair in rats on diets containing raw cottonseeds is reported, with the conclusion that gossypol, the toxic principle of cottonseed, is the factor responsible for the depilation. Inasmuch as daily supplements of yeast to provide additional vitamin G and of cystine were without effect and there was no interference with growth on the diet containing cottonseed, it is concluded that the physiological disturbances produced by gossypol and resulting in loss of hair may be entirely different from those produced by faulty protein or lack of vitamin G.

Mottled enamel of deciduous teeth, M. C. and H. V. SMITH (*Science, 81 (1935), No. 2090, p. 77*).—The authors note briefly the occurrence of severe mottled enamel on all the deciduous teeth of children in a community in Arizona in which the fluorine content of the water was exceptionally high, from 12 to 16 p. p. m. It is also noted that mottled enamel of the permanent teeth has been observed in persons in the same community who had not used the high fluorine water for drinking purposes, but had used it only for cooking and other household purposes.

Concerning the appearance of mottled enamel on the deciduous teeth, the authors state that "in spite of the fact that deciduous teeth are largely calcified before birth and have a relatively short period of both prenatal and postnatal development, it would appear that use of water containing excessively high concentrations of fluorine during the period of their formation produces mottled enamel of an extremely severe type on the temporary teeth."

Breath odors from alliaceous substances: Cause and remedy, H. W. HAGGARD and L. A. GREENBERG (*Jour. Amer. Med. Assoc., 104 (1935), No. 24, pp. 2160–2163*).—Both qualitative and quantitative tests are reported, demonstrating that the odor given to the breath by onions or garlic comes from the essential oils contained in these vegetables, that the oil reaches the breath solely from particles of the onion or garlic retained in the structure about the mouth, and that these particles cannot be removed completely by mechanical means, proprietary mouth washes, or alcohol.

"The breath can be immediately and completely rid of the odor by washing the teeth and tongue and rinsing the mouth with a solution of chloramine. The chlorine liberated in the mouth reacts chemically with the essential oils and deodorizes them."

TEXTILES AND CLOTHING

Fibre-maturity in relation to fibre and yarn characteristics of Indian cottons, A. N. GULATI and N. AHMAD (*Jour. Textile Inst., 26 (1935), No. 9, pp. T261–T292, figs. 7*).—The investigation reported was concerned with the effect of season, locality, heredity, and other factors on the fiber maturity of a number of Indian cottons; and the relationship of fiber maturity with mean lengths, fiber weight per inch and fiber strength, and its effect on neppiness and strength of yarns spun from these cottons.

Different cottons behaved differently in regard to the effect of season on fiber maturity, it being subject to seasonal fluctuation in some and affected very little in others. Locality of cultivation had a pronounced effect on Banilla cotton. Selections from the same common parents grown under similar conditions might differ significantly in fiber maturity. The saw-gin did not have any selective action on immature or half-mature fibers. Fiber maturity did not give a significant simple correlation with mean length, but detailed analysis showed that most short-staple cottons possessed high percentages of mature hairs while most long-staple cottons were characterized by low percentages of mature hairs. High fiber maturity was observed to accompany high fiber weight per inch and high fiber strength, the simple correlation coefficients between the 2 attributes being +0.60 and +0.72, respectively. Mature fibers were so definitely stronger than immature fibers that the lower quartile for the former exceeded the upper quartile for the latter. Yarn neppiness was correlated significantly with number of immature fibers in the cotton, simple and biserial correlation coefficients for 31 samples being +0.49 and +0.81, respectively.

Other factors, such as proportion of half-mature hairs and type of gin used, which may be responsible for yarn neppiness were considered. Making due allowance for these factors, the simple correlation coefficient between yarn neppiness and the combined percentage of immature and half-mature fibers was +0.67 for 28 samples.

The influence of fiber maturity on the spinning value of cotton was found to be masked by the other fiber properties, especially mean fiber length and fiber weight per inch. In medium- and long-staple cottons high fiber maturity was usually associated with better spinning performance, while in short-staple cottons the reverse was true, the simple coefficients for the 2 classes of cottons being +0.56 and —0.66, respectively. The importance of considering maturity percentages in addition to the other fiber properties in judging the quality of a cotton is discussed.

HOME MANAGEMENT AND EQUIPMENT

A study of farm families and their standards of living in selected districts of Nebraska, 1931–1933, M. Fedde and R. Lindquist (*Nebraska Sta. Res. Bul. 78 (1935), pp. 39, figs. 5*).—This report is based upon home accounts kept by 100 farm families in three counties of Nebraska during at least one of the years 1931, 1932, and 1933. The records total 183, including 58 for 1931, 69 for 1932, and 56 for 1933. There were 48 families from whom records were obtained for the 2-yr. and 25 for the 3-yr. period.

As a background to the detailed discussion of the money value of the family living and its distribution, information is given on the extent of farm ownership, composition of the families and households, ages of operators and homemakers, birthplaces of family members, educational background, reading interests, distances from community services, telephones and radios, family membership in organizations, the housing and economic status of the families, and the economic services of the farm woman.

In the discussion of the money values of the various items making up family living, comparisons are made of the averages for the 3 yr. with respect to farm ownership, size of family, level-of-living values, and age of the homemakers. The yearly averages are also compared to show to some extent the adjustments made to meet the decreasing incomes during the years of the study.

The total value of the family living for the 3-yr. period was $1,071.32 of which $445.71 was supplied by the farm. The distribution of the total money value among various items was as follows: Savings, $108.24; foods purchased, $127.06; foods supplied, $187.87; clothing, $93.45; housing supplied, $231; cash expended for housing, $15.99; operating, $161.57; health, $41.66; and development, $104.48.

The average money value of living was $1,226.36 for 1931, $1,008.58 for 1932, and $988.06 for 1933. The changes in distribution during the 3 yr. of decreasing income are shown for the three successive years as follows: Savings, 10.9, 10.8, and 8.8 percent; food, 31.2, 28.1, and 28.7 percent; clothing, 8.8, 8.3, and 9.1 percent; housing, 20.3, 25.2, and 23.7 percent; operating, 14.9, 14.7, and 15.9 percent; health, 3.5, 4.2, and 4 percent; and development, 10.4, 9.2, and 9.8 percent.

The accounts kept by 25 families throughout the 3-yr. period show a 21 percent decrease in the average value of living in 1932 from that of 1931 and a further decrease of 1 percent in 1933. "The decrease in cash expenditures was twice as large as the decrease in value of the living provided by the farm. In order of size of percentage decrease in 1932, church and charity ranked first; and gifts to persons outside the family, supplies and equipment, clothing, and purchased food followed in the order listed. The largest decrease in value of a single item was in food. In 1933 there was a further percentage decrease in church and charity, supplies and equipment, and water and telephone. The expenditure for health was greater in 1932 and less in 1933 than in 1931. The decrease in the net cash income lowered the amount for savings in 1932, and a further decrease occurred in 1933, which, translated into family practice, meant allowing insurance policies to lapse."

Other effects of the depression which cannot be expressed in figures are discussed at considerable length.

Time and cost evaluation of home laundering, V. E. Sater (*Washington Sta. Bul. 317 (1935), pp. 26, fig. 1*).—This discussion of the home laundering problem "from the standpoint of the time, energy, and financial costs for the housewife when using different kinds of equipment, 'old-fashioned' and modern, and available commercial services offered by power laundries" is based chiefly upon published material from various sources, including earlier reports from the station by Roberts (E. S. R., 65, p. 197) and Swartz (E. S. R., 69, p. 907). Information is included on types of service offered by laundries in the State as shown by questionnaires sent out in 1934.

The average power laundry in the State offers four kinds of service—wet or damp wash at a usual cost of 4 ct. per pound, combination at 6 ct., rough dry without starch 7 ct. and rough dry with starch 8 ct., and family finish at varying costs per piece. The customary bundle handled by these laundries ranges from 10 to 25 lb. From these figures estimates have been made of the total weekly cost of the three unfinished services based on conditions of an average family of five. Tabulated data are also given on the yearly cost of owning different kinds of washing and ironing equipment and the weekly cost of operating a home laundry plant with different types of modern equipment.

The general conclusions drawn are that the use of modern power equipment decreases the time and energy requirements in the performance of the weekly laundry task, but increases the financial cost of this task. Certain services now offered by commercial laundries make their use less prohibitive for the average home maker than formerly, but when the laundry is finished commercially the weekly cost is still prohibitive for the family of average means. For the three most commonly offered unfinished family services the weekly cost has been estimated to range from approximately $1.56 to $2.73, depending upon the kind of service used and the equipment used in the home for finishing the process.

Ten-year report of studies in child development and parent education, E. B. Waring (*[New York] Cornell Sta. Bul. 638 (1935), pp. 69, fig. 1*).—This progress report covering a 10-yr. period includes an outline of the various fields of investigation with titles of the individual projects, a brief discussion of the most significant trends of study as developed during the period, and abstracts of individual studies which have been completed as a whole or in part.

The fields of investigation are classified as studies of technics which may be feasible both at home and at school for observing and recording the behavior, studies of personality, and specialized studies on health, nutrition, behavior, and adult guidance of young children. Included among the studies abstracted are master's theses, minor studies for doctorate, and published and hitherto unpublished staff research.

A subject and author index adds to the usefulness of the report.

Bibliography on stone houses, 1920–1934, compiled by D. W. Graf (*U. S. Dept. Agr., Bur. Agr. Engin., 1935, pp.* [*5*]).—A partial list of references.

Bibliography on fireplaces, 1900–1934, compiled by D. W. Graf (*U. S. Dept. Agr., Bur. Agr. Engin., 1935, pp.* [*17*]).—A selected list of references.

The feasibility of using a heat storage device for domestic heating with electricity, H. J. Dana and R. E. Lyle (*Wash. Engin. Expt. Sta. Bul. 46* (*1935*), *pp. 20, figs. 5*).—Experiments on the use of a heat storage device are reported. The device used involved a heat storage oven filled with granite boulders.

While the results reported are only preliminary, they indicate that so far as the occupants are concerned there was no apparent difference between this type of heating and heating by the hot air furnace.

MISCELLANEOUS

Forty-seventh Annual Report [of Georgia Station], 1935, H. P. Stuckey (*Georgia Sta. Rpt. 1935, pp. 52, figs. 11*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Forty-eighth Annual Report of the Pennsylvania Agricultural Experiment Station, [1935], [R. L. Watts et al.] (*Pennsylvania Sta. Bul. 320* (*1935*), *pp. 35, figs. 5*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue. Meteorological data (pp. 33, 34) are also included.

Information regarding recent publications (*Kansas Sta. Circ. 175* (*1935*), *pp. 3*).—This circular briefly describes Bulletins 265–271 and Circulars 172–174, all previously noted.

NOTES

Arizona University.—President Homer L. Shantz has been appointed Chief of the newly established Division of Wildlife Management of the U. S. D. A. Forest Service, effective June 1.

Kentucky Station.—Dr. W. T. Forsee, Jr., has been appointed assistant chemist, effective February 1.

Mississippi College and Station.—Recent appointments include H. W. Bennett and I. E. Miles as associates in agronomy, the former for research dealing primarily with the selection and breeding of forage and soil improving crops and the latter to give half time to the teaching of soils and half to research in the relative symbiotic nitrogen fixation of several legumes.

Nevada Station.—A two-story brick building formerly occupied by the extension service has been placed at the disposal of the station and is undergoing reconstruction to house the laboratories in veterinary science and chemistry.

With the cooperation of the Nevada Emergency Relief Administration and the Works Progress Administration investigations have been in progress for the past 18 mo. on the relationship between tree growths and stream run-off in the Truckee River Basin. Over 200 samples taken from living western yellow pine trees with a Swedish increment borer have been collected, and over 50,000 measurements of individual rings have been made. The trees have been chosen from selected sites where there was little opportunity for any moisture other than that which fell in the immediate vicinity of the tree to reach the roots of the trees.

From the analysis of the data it appears that there is a relationship between tree growth and stream run-off. For the Truckee River, evidence of this is shown by a mathematical correlation of 0.88. On the basis of this relationship curves have been prepared for periods of 200 and 400 yr., which show the trends in tree growth and run-off for those periods. The curves indicate many alternating periods of drought and abundant moisture conditions. The period from about 1820 to 1870 is shown as very dry, while from 1870 to about 1915 was very moist. The present drought cannot be said to be as long continued or as severe as some of those indicated in the tree-ring record.

North Carolina College and Station.—Dr. H. B. Mann, station associate in soil fertility, resigned Jan. 1 to become associate regional director in the Southern States for the American Potash Institute, with headquarters at Atlanta, Ga., and will be succeeded on April 1 by Dr. Emerson R. Collins, assistant soil technologist in the U. S. D. A. Bureau of Chemistry and Soils. Dr. G. K. Middleton, seed specialist for the extension service, has been transferred to the station as cereal agronomist to conduct research in cereal breeding and has been succeeded by A. D. Stuart. S. L. Clement, county agent in Hertford County, has been appointed associate in farm marketing.

Pennsylvania College and Station.—Gordon Trembly has been appointed instructor in fish culture in the department of zoology and entomology. He will devote full time to the prosecution of a Purnell project on the biological life of Pennsylvania trout streams and methods of stream improvement.

Dr. Walter Thomas, professor of phytochemistry and phytochemist, has been appointed a member of the court of governors of the University College of Wales for a 10-yr. term.

Utah Station.—Dr. Lowry Nelson, Chief of the Project Planning Section of the Rural Resettlement Division of the U. S. Rural Resettlement Administration, has been appointed director of the station.

American Society of Animal Production.—The twenty-eighth annual meeting of this society was held in Chicago from November 29 to December 1, 1935. The program was built around the theme of changes which will come in animal production if planned utilization of land becomes a reality. This subject was discussed from the general standpoint by the president, H. H. Kildee, and from the regional point of view by J. A. Hill, W. C. Coffey, H. L. Garrigus, and M. P. Jarnagin. In addition, the relationship of the program of adjustment to the production of dairy cattle, beef cattle, swine, horses, and sheep was discussed at the sectional luncheon meetings pertaining to these classes of animals.

One of the evening programs was devoted to the presentation by O. E. Reed and Dr. H. C. McPhee of the findings from the cooperative survey for superior germ plasm in dairy cattle and other classes of animals. Consideration was also given to the role of hormones in reproduction, and a symposium was held on methods of artificial insemination in livestock.

Officers elected for the ensuing year were as follows: President, W. J. Loeffel, and vice president, G. A. Brown. Dr. J. L. Lush of the Iowa College and Station was reelected secretary-treasurer.

American Society of Agronomy.—The twenty-eighth annual meeting of this society was held in Chicago December 5 and 6, 1935, with an attendance considerably in excess of 400.

The address of the president, H. K. Hayes, was entitled Green Pastures for the Plant Breeder. This address reviewed some of the accomplishments in plant breeding during the past 35 yr., and suggested fields deemed especially promising as regards future research and experimentation.

The officers for the ensuing year comprise the following: President, R. M. Salter; vice president, F. D. Richey; chairman of the crop section, H. B. Sprague; chairman of the soils section, W. A. Albrecht; editor, J. D. Luckett; and secretary-treasurer, P. E. Brown, Ames, Iowa. Action was taken by the soils section ratifying a proposal to unite this section and the American Soil Survey Association "to form a single organization which shall be called the American Society of Soil Science." A joint reorganization committee of the two groups was continued with instructions to draft a constitution for the proposed society to be submitted with a view to final action at the 1936 annual meetings. A second joint committee was appointed to formulate editorial policies for the proposed proceedings.

Special emphasis in the committee reports was given to the opportunities for cooperative pasture research and to studies of machine application of fertilizers which have been conducted at 44 locations in 15 States. A bibliography of 134 titles of the more important recent contributions on the methodology and interpretation of field plat experiments was prepared by a committee headed by H. M. Steece. The Chilean Nitrate Rare Element Research Award was made to J. S. McHargue, Anna L. Sommer, and L. G. Willis. Richard Bradfield, C. E. Millar, and A. C. Arny were elected fellows of the society.

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EXPERIMENT STATION RECORD

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KENYON LEECH BUTTERFIELD, EVANGEL OF A BETTER RURAL LIFE

Nearly 30 years ago President Theodore Roosevelt, speaking at the semicentennial celebration of the Michigan Agricultural College, pointed out that the problem of the farm is much more than the growing of wheat and corn and cattle. "We hope ultimately," he said, "to double the average yield of wheat and corn per acre. It will be a great achievement; but it is even more important to double the desirability, comfort, and standing of the farmer's life." A generation later, much still remains to be accomplished in this direction, but few would deny that distinct progress has been made. In this attainment many men have contributed, but perhaps none have been more active in leadership and more farseeing in inspiration than Dr. Kenyon Leech Butterfield. His death in Amherst, Mass., on November 26, 1935, brought to a close in his sixty-eighth year a notable career, not only in this field but in that of land-grant college administration and in other lines.

President Butterfield inherited and assiduously fostered the rural viewpoint. He began life as a farm boy in Michigan, was graduated from the Michigan Agricultural College in 1891, and served 3 years as a Grange official and editor, 4 years as State superintendent of farmers' institutes, and a year as instructor in rural sociology in the State university. His ability was early recognized, a faculty member predicting prior to his junior year his ultimate appointment as a college president. This prophesy was thrice fulfilled—at the Rhode Island State College from 1903 to 1906, at the Massachusetts Agricultural College from 1906 to 1924, and at his Alma Mater from 1924 to 1928.

Upon all three institutions he left a distinctive impress, but it was at the Massachusetts College that the opportunity was greatest and his accomplishments most substantial. Here many new departments, notably in agricultural economics and rural sociology, were set up and older departments were rejuvenated and redirected. The curriculum was broadened and strengthened. Buildings, equipment, and personnel were much increased in an attempt to keep pace with an enrollment which rapidly expanded as the college became more widely known and better appreciated.

Beyond the campus the influence of the institution was also largely extended under his leadership. Closer relationships were developed with other institutions and with the educational system of the State. The observance of the fortieth anniversary of the college in 1907 by means of what was then a novel conference on rural progress, bringing together the varied forces for rural betterment—educational, social, and religious, as well as those distinctively agricultural—was the forerunner of many new contacts and the development of an enlarging consciousness of the need of thorough understanding and sympathetic cooperation in the solution of rural problems and of a broader conception of the responsibility of the agricultural colleges and experiment stations in all that pertains to rural welfare.

Much that President Butterfield accomplished was in connection with the Association of American Agricultural Colleges and Experiment Stations. A young man when he first became associated with this body, he soon rose to prominence. He early visualized the need and championed the cause of agricultural extension, and he advocated with earnestness and effectiveness the introduction and development of courses in agricultural economics and rural sociology. Elected president in 1916, his address before the convention of 1917 dealt with the problems immediately confronting the land-grant institutions during the war, but even more broadly and constructively with attitudes and policies to be attempted in the post-war period. In this connection, he said in part:

"The Morrill Act institutions must deal with all the problems of a democracy. In research, they must seek the principles that underlie the most effective use of all the resources and powers of earth and sky. But the people demand more than that. They crave also light and leading with respect to those political, economic, and social adjustments which they feel are essential to their full welfare. Gentlemen, our programs are still too small and narrow. . . . In our investigations we still stress too much the goal of increased productivity as our great task. We still have too much faith in knowledge of the physical and biological facts and principles as all sufficing. . . . We still send out too many farmers whose chief concern is more corn; too many engineers who have no touch with the human problems of industry; too many lawyers and business men unmoved by the ideal that their life aim should be service to the democracy. . . . To socialize as well as train experts, to give men and women a vision of the new social order, to equip them with the tools that may forge for the common man a new freedom out of the shackles of ignorance as well as out of the chains of injustice, to send them forth as persons who know the meaning of life and its toil as well as they know the technic of their chosen calling—these are the very secrets of power for our land-grant colleges and universities in the new day."

In 1918, he was given leave of absence to become associated with the Army Educational Commission of the Y. M. C. A. in charge of the agricultural, vocational, and general technical instruction with the American Expeditionary Forces in France. This remarkable undertaking (E. S. R., 41, p. 101) culminated so far as agriculture was concerned in an interallied rural life conference held in Beaune in 1919. Thereafter, his interest in rural life problems became international. He helped to organize and was the first president of the World Agriculture Society, with which about 60 organizations related to rural life became affiliated. Upon retiring from college administration, he turned to openings abroad, serving as an expert adviser in rural work to the Jerusalem Conference in 1928, making a trip in 1929 under the auspices of the Carnegie Corporation to study rural conditions and sociological problems in South Africa, and spending several years in the Orient as rural counselor to the International Missionary Council. In consequence, to quote Mr. Ray Stannard Baker, "he knew well the country life and the country problems of Europe and of China and India and South Africa and Palestine. I think at the time of his death he knew and had thought more deeply upon the problems of life on the soil in all parts of the earth than any other man in America, if not in the world."

However this may be, it is certain that few men have given a longer or more devoted allegiance to the cause of rural betterment in this country. His selection in 1908 as a member of the Roosevelt Commission on Country Life was an early recognition of his interest and qualifications. Later he had much to do with the organization and development of the American Country Life Association. Still another means of influence was through his books, among which may be mentioned Chapters in Rural Progress (1908), The Country Church and the Rural Problem (1910), The Farmer and the New Day (1919), and A Christian Program for the Rural Community (1923). It is understood that when death intervened he had additional publications under consideration, as well as renewed activities in rural sociology.

The evaluation of a career like President Butterfield is no simple matter. Mr. Baker has epitomized his work as president in the following language: "Buildings he built and the number of students he increased, but what he really did was to fire old institutions with new purpose and new life, spiritualizing them with his own vision and enthusiasm." As an evangel of a better rural life, his influence was sometimes intangible but in the end pervasive. He will not soon be forgotten.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Investigations in plant and microbial chemistry by the Wisconsin Station] (*Wisconsin Sta. Bul. 430 (1935), pp. 34, 35, 101, 102, 103–105, fig. 1*).—A method for removing starch from plant tissues by a treatment with a dilute solution of nitric acid in ethyl alcohol at 175° F., followed by extraction of the starch with warm, dilute alcohol, is briefly reported upon by K. P. Link, C. Niemann, and R. H. Roberts.

Conditions and culture medium components favoring the production of lipides and sterols by *A[spergillus] fischeri* are noted by E. A. Prill and P. R. Wenck, and an investigation of the lipides produced by *P[enicillium] aurantio-brunneum* by F. M. Strong and E. H. Krocker.

E. L. Tatum has isolated and identified the compound (*l*-asparagine) responsible for the stimulation of the growth of butyric acid bacteria. It has been shown by A. F. Langlykke, W. H. Peterson, and E. B. Fred that butyric acid-producing bacteria are useful in fermenting glucose; by M. Ingraham, Fred, and H. Steenbock that glycerol favors production of carotene by bacteria; and by P. W. Wilson, C. E. Georgi, E. Smyth, F. Wagner, and F. S. Orcutt that the carbohydrate: nitrogen ratio plays an important role in nitrogen fixation by legumes.

Physicochemical effects produced by the irradiation of crystalline egg albumin solutions with α particles, L. E. Arnow (*Jour. Biol. Chem., 110 (1935), No. 1, pp. 43–59, figs. 11*).—In an investigation carried out at the University of Minnesota, it was found that the irradiation of egg albumin solutions with α particles resulted in the formation of a visible coagulum when the initial pH of the solution was that of the isoelectric point and in the utilization of oxygen by the protein molecule, the oxygen being supplied by the decomposition of water by the α particles. Hydrogen in smaller equivalent amounts was also utilized. The utilization of the hydrogen was shown to involve at least two reactions in the case of egg albumen and at least three reactions in the case of gelatin.

The pH of isoelectric solutions and of solutions of pH less than that of the isoelectric point were little affected by the irradiation, but in solutions of pH greater than the isoelectric point the pH was markedly lowered.

The ultraviolet absorption was increased in the case of solutions at or below the isoelectric point, but was decreased in the case of solutions above the isoelectric point.

The viscosities of solutions at or below the isoelectric point were raised by the irradiation, but when the pH of the protein solution was greater than that of the isoelectric point the viscosity was lowered.

The temperature of coagulation was lowered by exposure of the protein solutions to α particles when the pH of the solution was equal to or greater than that of the isoelectric point. At lower values of the pH, the coagulation temperature was increased.

The enzymatic hydrolysis of raw and heat-treated egg white, E. W. COHN and A. WHITE (*Jour. Biol. Chem., 109 (1935), No. 1, pp. 169–175*).—The authors cite the work of a number of investigators as showing the conflicting results obtained in physiological experiments on the relative digestibility of raw and cooked egg white, and refer also to the experiments of Jones and Waterman (E. S. R., 48, p. 61) as supporting the view that the effect of heating upon the subsequent rate of digestion of a protein in vitro varies with the nature of the protein.

Further supporting the last-named opinion, the experiments here recorded showed that pepsin produced no significant splitting of raw egg white under the experimental conditions employed. The hydrolysis effected by trypsin was slight. A preliminary incubation of the raw egg white with pepsin greatly facilitated an attack on the material by trypsin.

Preliminary periods of heating, up to 30 min. in length, increased the degree of hydrolysis of egg white by trypsin. The extent of digestion of egg white by the successive action of pepsin and trypsin also varied directly with the length of the preliminary heating period to which the substrate was subjected.

"These experimental results are interpreted as supporting the existence in raw egg white of an antitryptic agent which is slowly inactivated by heat."

The preparation of glutamine, H. B. VICKERY, G. W. PUCHER, and H. E. CLARK (*Jour. Biol. Chem., 109 (1935), No. 1, pp. 39–42*).—The authors of this contribution from the Connecticut [New Haven] Experiment Station, by modifying the method of E. Schulze and E. Bosshard, were able to obtain glutamine in yields of from 78.9 to 84.9 percent of the total content from the root tissue of the common beet (*Beta vulgaris*).

"The yield depends on the richness of the tissue employed, and this may vary from 1.7 to 4.5 g or even more per kilo of roots as determined by the indirect method on the extract. Higher yields are usually to be obtained from beets that have been in storage for some time than from fresh plants. In any case the yield of recrystallized material should be approximately 80 percent of the quantity of glutamine present in the tissue."

In brief the modified method is as follows: From 5 to 6 kg of the trimmed and washed roots are ground and pressed. The press residue is placed in a cheesecloth bag and suspended in ether for ½ hr. to bring about cytolysis, and is then again pressed and washed twice with water, each washing being pressed out. The extract is clarified by adding basic lead acetate solution, is filtered through paper pulp, and is further treated with a mercuric nitrate solution of which the acidity has been so far neutralized as to produce a very faint opalescence. After adding the mercuric nitrate reagent to a point beyond which no further precipitate can be obtained after 5 min., the mixture is made neutral to litmus by adding 10 percent sodium hydroxide solution. The white precipitate, which settles quickly, is separated and washed, either at once by centrifuging or, after standing overnight, by decantation. The mercury compound is decomposed by treatment with hydrogen sulfide, and the filtrate is concentrated under diminished pressure and at a water bath temperature of 60° C. until the hydrogen sulfide has been removed. The glutamine solution is then made neutral to litmus by means of ammonium hydroxide (crystallization could not be obtained after neutralizing with magnesium, lithium, or sodium hydroxides) and is further concentrated at 60° to about one-tenth of the original volume of the extract, after which it is filtered through pulp to remove further traces of mercuric sulfide, and the concentration under diminished pressure at 60° is continued until the glutamine separates as a thick sludge of crystals. The crystals are nearly, but not quite, dissolved in water heated to 60°, and the amide is again made to crystallize by adding to the solution twice its volume of alcohol.

Complex salts of amino acids and peptides.—I, Metal complex salts of glycine and their specificity, M. Bergmann and S. W. Fox (*Jour. Biol. Chem., 109 (1935), No. 1, pp. 317–324*).—It was found that "the long known and readily available potassium trioxalatochromiate (I) reacts with glycine. [I= $[Cr(C_2O_4)_3]K_3+3H_2O$]. It forms several well-crystallized double salts containing both glycinium and potassium as cations. In the presence of hydrochloric acid in water-alcohol solution, the compounds II and III were found. [II= $[Cr(C_2O_4)_3]_6K_{13}(C_2H_6O_2N)_6$ HCl; III= $[Cr(C_2O_4)_3]_6K_{13}(C_2H_6O_2N)_5 \cdot 3H_2O$]. Compound II, which contains glycine and chromium complex in equivalent amounts, results from solutions containing an excess of glycine. Without this excess, products usually result which have the peculiar ratio of 5 equivalents of glycine to 6 chromium complex radicals as in III."

The authors "tried in vain . . . to place amino acids other than glycine in combination with potassium trioxalatochromiate. Apparently, glycine is the only amino acid which forms a potassium trioxalatochromiate under the prevailing conditions. From hydrolysates of gelatin and keratin only glycine was precipitated as potassium trioxalatochromiate. Other amino acids were not obtained in demonstrable quantities. This makes possible an estimation of glycine in hydrolysates of proteins and similar substances."

The method based upon these observations is to be presented in a later paper. In the preliminary experiments here described, from 75 to 85 percent of the calculated glycine content of gelatin hydrolysates was recovered and could be further identified by conversion into hippuric acid.

The preparation of the optically active isomers of homocystine and the demonstration of their configurational relationship to naturally occurring methionine, V. du Vigneaud and W. I. Patterson (*Jour. Biol. Chem., 109 (1935) No. 1, pp. 97–103*).—N-formyl-*dl*-S-benzyl-homocysteine was resolved by means of brucine, and the optically active benzyl homocysteines obtained from the brucine salts of the formyl derivatives were converted to the corresponding homocystines by scission of the benzyl group by sodium in liquid ammonia and oxidation of the resulting sodium homocysteinates. Both isomers were found to be obtainable in a high degree of purity and in excellent yield.

The optical isomers of homocystine so obtained were converted to the corresponding methionines. The homocystine possessing a specific rotation of $\alpha]_D^{26}=+77°$ in hydrochloric acid solution, and a rotation of $[\alpha]_D^{26}=-16°$ in aqueous solution yielded *l*-methionine identical with the naturally occurring methionine. This isomer of homocystine, designated *l*-homocystine, therefore corresponds in spatial configuration to the naturally occurring series.

The combination of certain fatty acids with lysine, arginine, and salmine, T. H. Jukes and C. L. A. Schmidt (*Jour. Biol. Chem., 110 (1935), No. 1, pp. 9–16, figs. 2*).—The values obtained in measurements of the pK′ values of 10 straight-chain saturated fatty acids in various ethanol-water mixtures indicated that all of the higher fatty acids examined possess nearly identical pK′ values, and that their pK′ values in water probably lie between 4.9 and 5.0. When lysine and arginine were titrated electrometrically with lauric and oleic acids in 72 percent ethanol, fairly close agreement between the calculated and the observed values was obtained. The salts thus produced were hydrolyzed less than 1 percent. Titration curves of salmine with hydrochloric, caprylic, and lauric acids in ethanol-water mixtures indicate that combination took place in every instance. The pK′ value of salmine was found to be markedly increased by increasing the concentration of ethanol. Its value in water is about 11.0. Salmine is a stronger base than arginine.

Salts of lysine and arginine with certain of the higher fatty acids were prepared, and some of their properties are described briefly.

Some observations concerning the chemistry of arachidonic acid and its quantitative estimation, W. C. Ault and J. B. Brown (*Jour. Biol. Chem., 107 (1934), No. 3, pp. 615–622*).—The preparations of methyl arachidonate by three distinct methods are described in a contribution from the Ohio State University. The three preparations showed no essential differences in polybromide number. The constants of highly purified methyl arachidonate and arachidonic acid are recorded. The possible application of these results to the quantitative estimation of arachidonic acid is discussed, together with their more general application to the determination of highly unsaturated acids. The lithium soap-acetone method was shown to be a satisfactory procedure for the direct isolation of arachidonic acid.

The methylglycosides of the naturally occurring hexuronic acids.—IV, Polygalacturonic acid-methylglycosides derived from Ehrlich's "Pektolsäure" and "Pektolactonsäure", L. Baur and K. P. Link (*Jour. Biol. Chem., 109 (1935), No. 1, pp. 293–299*).—Continuing this series (E. S. R., 72, p. 439), "the action of dry hydrogen chloride in absolute methyl alcohol on Ehrlich's Pektolsäure and Pektolactonsäure preparations, obtained from both citrus and apple pectin", has been investigated at the Wisconsin Experiment Station, with the result that "when refluxed for 90 hr. about 30 percent of the Pektolsäure and 90 percent of the Pektolactonsäure were dissolved."

In each case the insoluble residue consisted mainly of an esterified polygalacturonide in the form of its methylglycoside. Analysis of this polyester, as well as its sodium salt, barium salt, and free acid, showed that it contained approximately 10 galacturonic acid units.

"Ehrlich's belief that his Pektolsäure and Pektolactonsäure preparations are definite compounds containing 4 galacturonic acid units is not in harmony with the results obtained."

Oxidation of certain amino acids by "resting" Bacillus proteus, F. and M. L. C. Bernheim and M. D. Webster (*Jour. Biol. Chem., 110 (1935), No. 1, pp. 165–172, fig. 1*).—The authors obtained evidence which led them to believe that in the presence of resting *B. proteus* certain amino acids are oxidized, decarboxylated, and deaminated. They report that leucine, phenylalanine, and methionine are oxidized rapidly, and that 1 atom of oxygen is utilized per molecule; that serine, alanine, and proline utilize 3, 4, and 7 atoms, respectively; that the oxidation of tyrosine and tryptophan is slower and that 2 and 3 atoms, respectively, are used; that valine, isoleucine, hydroxyproline, and histidine are oxidized "so slowly that no definite uptakes were obtained"; and that glycine is completely oxidized.

Bacterial metabolism.—I, The reduction of propionaldehyde and of propionic acid by Clostridium acetobutylicum, K. C. Blanchard and J. MacDonald (*Jour. Biol. Chem., 110 (1935), No. 1, pp. 145–150*).—The authors found that, when added to actively fermenting cultures of *C. acetobutylicum*, both propionaldehyde and propionic acid are reduced to the corresponding alcohol, *n*-propanol, without the accompanying formation of any other end products which are not normally formed by this micro-organism in the fermentation of carbohydrates.

"As a result doubt is cast upon the commonly accepted hypothesis that aldol condensation constitutes an important intermediary step in the formation of butyric acid and *n*-butanol from carbohydrates by *C. acetobutylicum*."

The mucilage from psyllium seed, Plantago psyllium, L., E. Anderson and M. Fireman (*Jour. Biol. Chem., 109 (1935), No. 1, pp. 437-442*).—A contribution from the University of Arizona reports an examination of the mucilage from psyllium seed, which was found to consist of a mixture of polyuronides. "These bodies are composed of *d*-galacturonic acid combined with *l*-arabinose. The latter sugar is combined with chains of *d*-xylose molecules varying in length from 8 to 35 molecules and a small amount of an *X* body."

The carbohydrates of lupine seeds [trans. title], A. Mazzaron (*Bol. Soc. Eustach., 32 (1934), No. 4, pp. 243-246*).—Analysis of seeds of *Lupinus albus* gave a starch content of 3.97 percent, although the usual iodine test was negative. The other carbohydrates found were reducing sugars (glucose) 0.27 percent, nonreducing sugars (sucrose) 3.34 percent, dextrins 2.43 percent, and hemicelluloses 10.19 percent.—(*Courtesy Biol. Abs.*)

The hemicelluloses extracted from mesquite wood after chlorination, L. Sands and P. Nutter (*Jour. Biol. Chem., 110 (1935), No. 1, pp. 17-22*).—According to observations reported from the University of Arizona, nearly half of the hemicellulose of mesquite wood is rendered insoluble by the presence of lignin and becomes soluble in 10 percent sodium hydroxide upon the delignification of the wood. The methoxyl group remained associated with that fragment of the hemicellulose molecule which contained the uronic acid. Boiling for 30 hr. in 2.5 percent sulfuric acid failed to remove the last two pentose groups from the uronic acid nucleus. Xylose was the only sugar of quantitative importance found in the hemicellulose. Glucose, from an easily hydrolyzable hexosan, was found among the hydrolytic products of one of the fractions. Oxidation of the cellulose by chlorine was considered to be negligible until after delignification was complete, oxycellulose being found only after the fourth chlorination. The number of molecular species in the hemicellulose could not be estimated, but the hemicellulose appeared more complex than that isolated before delignification.

Pigments of the Mendelian color types in maize—chrysanthemin from purple-husked maize, C. E. Sando, R. T. Milner, and M. S. Sherman (*Jour. Biol. Chem., 109 (1935), No. 1, pp. 203-211, figs. 3*).—In an investigation carried out at the U. S. D. A. Bureau of Chemistry and Soils, chrysanthemin chloride has been isolated in pure form from purple-husked maize and identified. "The latter is one of a series of color types in maize whose heritable behavior has been determined by Emerson [E. S. R., 45, p. 533]. Since factorial compositions have been assigned to this series of color types and it has been shown that flavonol and anthocyanidin pigments are involved as color characters, it goes without saying that this series affords ideal material for a chemical interpretation of the Mendelian factors involved. The pigments have now been worked out from the brown-husked and purple-husked types. The evidence obtained thus far favors the possibility of a conversion of the flavonols to anthocyanidins by reduction of their corresponding homologous glucosides."

Chrysanthemin chloride was purified in the form of its picrate. The regenerated pigment on hydrolysis yields molecular proportions of cyanidin chloride and glucose.

Pigments of pink grapefruits, Citrus grandis (L., Osbeck), M. B. Matlack (*Jour. Biol. Chem., 110 (1935), No. 1, pp. 249-253, figs. 2*).—In an investigation carried out at the U. S. D. A. Bureau of Chemistry and Soils, the pigments occurring in the flesh of the Foster and of the Marsh pink grapefruits were extracted with carbon disulfide and, after preliminary purification, separated and isolated in a fair state of purity by means of the Tswett chromatographic method. Their identification as lycopene and β-carotene was confirmed spectroscopically.

A contribution to the chemistry of pepper pigments: The red pigment in the Perfection pimiento (Capsicum annuum), W. L. BROWN (*Jour. Biol. Chem., 110 (1935), No. 1, pp. 91–94*).—The characteristic red coloring matter isolated from the Perfection pimiento is stated by the author of this communication from the Georgia Experiment Station to have been found to be identical with the capsanthin from Hungarian paprika.

Reactions of dyes with cell substances, I–III (*Jour. Biol. Chem., 110 (1935), No. 1, pp. 113–118, fig. 1; 119–140, figs. 16; 141–144, figs. 3*).—These three papers record a study of the chemical nature of the combinations between dyes commonly used as biological stains and certain tissue components isolated by chemical methods and treated with various fixing solutions before staining, together with the colors produced in such stainings.

I. *Staining of isolated nuclear substances*, E. G. Kelley and E. G. Miller, Jr.—β-nucleohistone was prepared from beef thymus, α-nucleoprotein by precipitation with HCl (at pH 4.7) from the filtrate obtained in the nucleohistone preparation and also directly from a 0.9 percent NaCl extract of the gland, nucleic acid from material also obtained from the same gland, histone from nucleohistone, and metaprotein by hydrolysis of α-nucleoprotein.

A table of the results of fixing and staining these isolated cell substances shows the hues and intensities of coloration obtained with thionine, light green SF yellowish, oxidized hematoxylin with and without the ferric ammonium sulfate mordant, and the Feulgen stain with and without hydrolysis, after fixation with phosphotungstic acid, mercuric chloride, formaldehyde, and 95 percent alcohol.

In the case of unmordanted hematoxylin, the histological metachromasy appeared to depend directly on pH effects.

II. *The differential staining of nucleoprotein and mucin by thionine and similar dyes*, E. G. Kelley and E. G. Miller, Jr.—Of the dyes examined, all which on dilution showed a definite shift of maximum light absorption toward the longer wave lengths gave a color differentiation between mucins and nucleoproteins parallel to that given by the thionine or toluidine blue technic. The color of the stained mucin indicated preponderant staining by the dye form occurring in concentrated aqueous solution, while the color taken by the nucleoprotein corresponded to that of the dye in the dilute solution.

"This differentiation is not conditioned by the pH, within the limits in which the dye cation can combine with the protein. . . . It is postulated that this type of metachromatic histological differentiation of tissue proteins is to be explained on the basis of the same phenomenon that is involved in the dilution shift of absorption maxima."

Experiments on the effects of the proteins on the dyes are reported, and possible theories are briefly discussed. Experiments dealing with the nature of the color shift on dilution are also reported, and several hypotheses are discussed.

III. *An apparatus for the definition of color in stained histological sections*, E. G. Kelley.—An apparatus similar, in part, to a monochromatic colorimeter is described, its optical principles being indicated in a diagram and its construction, in part, by photographs.

The purification of the enzymes which oxidize certain amino acids, F. and M. L. C. BERNHEIM (*Jour. Biol. Chem., 109 (1935), No. 1, pp. 131–140, fig. 1*).—A method for obtaining from the kidney of the rat, cat, or dog a purified preparation which oxidizes alanine, phenylalanine, valine, leucine, isoleucine, proline, serine, and methionine is described.

A study of the *dl* mixtures and the natural isomers of the first six of these amino acids indicated that the unnatural isomers are preferentially oxidized.

The natural isomers of serine and methionine were not tested. Similar preparations from livers oxidized only proline. With the exception of proline, all the unnatural isomers of the amino acids oxidized by the kidney preparations were deaminated. The extent of the deamination corresponded to the oxygen uptake, 1 atom of oxygen having been taken up for every molecule of amino acid oxidized. Methylene blue was reduced in the presence of the preparation by all the amino acids named above but at varying rates. *Dl*-phenylglycine was not oxidized by the purified preparation. Glycine was not oxidized by any of the preparations tried.

The activation of arginase, L. Weil (*Jour. Biol. Chem., 110 (1935), No. 1, pp. 201–209*).—This paper presents evidence indicating that the system, cysteine-ferrous iron, activates arginase independently of the origin or purity of the enzyme preparation, and that the partial activations obtained with cysteine alone or ferrous iron alone depend upon the source and purity of the enzyme.

"The activation picture of liver arginase is changed by feeding the animals (rats) α,α'-bipyridine, which combines with ferrous iron. This indicates that heavy metal plays an important role in arginase activation in vivo."

Glyoxalase, II–IV (*Jour. Biol. Chem., 106 (1934), No. 1, pp. 179–190, fig. 1; 109 (1935), No. 1, pp. 1–10, fig. 1; 11–27, figs. 3*).—The three papers here noted continue the series (E. S. R., 73, p. 584).

II. *The distribution of glyoxalase in tissues of normal and cancerous albino rats*, M. E. Platt and E. F. Schroeder.—The kinetic behavior of animal tissue glyoxalase has been shown to be identical with that previously reported for acetone-yeast glyoxalase. Observations made in connection with a quantitative study of the distribution of glyoxalase in aqueous extracts of organs of normal and cancerous rats and mice are recorded, together with conclusions drawn from the data obtained.

III. *Glyoxalase as a reagent for the quantitative microestimation of glutathione*, G. E. Woodward.—A manometric method for the determination of reduced glutathione in tissues is described. The method depends upon the measurement of the activating effect of glutathione on acetone-yeast glyoxalase. "The effect of glutathione is specific, neither cysteine, thioneine, ascorbic acid, nor oxidized glutathione (among other substances) producing any activity.

"Glutathione values in tissues by this method are considerably lower than by iodometric titration. In blood there is not this discrepancy. 2,6-Dichlorophenol indophenol titrations in most cases account for the difference between the iodometric and manometric values for glutathione."

IV. *The antiglyoxalase action of kidney and pancreas preparations*, G. E. Woodward, M. P. Munro, and E. F. Schroeder.—"Kidney tissue of rat, rabbit, pig, and horse contains a powerful inhibitor of the enzyme glyoxalase." A method for measuring the quantity of inhibitor present is described, and various observations are recorded.

"The inhibitor exerts its effect by destroying the coenzyme glutathione, the enzyme itself being unaffected. The action on glutathione does not involve destruction of the sulfhydryl group."

Ascorbic acid (vitamin C) oxidase, H. Tauber, I. S. Kleiner, and D. Mishkind (*Jour. Biol. Chem., 110 (1935), No. 1, pp. 211–218, figs. 2*).—The authors report that "our enzyme differs in various ways from the hexoxidase . . . found in cabbage leaves. The hexoxidase oxidizes not more than 25 percent of the substrate even when present in excess, and its kinetics . . . point to a very complicated effect of a number of catalysts. The enzyme of the Hubbard squash oxidizes 100 percent of the substrate rapidly, and its kinetics are those of a single enzyme. It does not affect phenols, glutathione, cysteine, or adrenaline, nor could we find any other substrate for this enzyme. . . . The oxidase is inactivated by trypsin, which shows that like many other enzymes it is either a protein or has protein as an indispensable part of it."

On peroxidase, A. K. BALLS and W. S. HALE (*Jour. Biol. Chem.*, *107* (*1934*), *No. 3*, *pp. 767–782*, *fig. 1*).—From a study of the course of the reaction with various phenolic and aminated substrates and from other data obtained in an investigation carried out at the Bureau of Chemistry and Soils, U. S. D. A., the authors tentatively conclude that the enzyme is able to combine to some extent with almost any phenol or amine. "The structure may, however, determine whether such a compound can undergo oxidation after it is formed, and further determine whether, after oxidation, the enzyme still remains active. . . . If, as seems probable, the reaction is in all cases the same, then the specificity resides in a molecular structure capable of combining with the enzyme (in the peroxide state) and also capable of undergoing a specific type of oxidation which the ferment can accelerate. The specific type of oxidation is probably quinone (or imide) formation, as may be deduced from the production of an *o*-quinone from pyrogallol and the fact that metaquinones do not exist. When the formation of a quinone is impossible the enzyme is injured, which can indicate that it normally functions as a dehydrogenase; that is, by simultaneously removing two hydrogen atoms attached to different C atoms."

A hot-water funnel, J. R. CALDWELL (*Indus. and Engin. Chem.*, *Analyt. Ed.*, *7* (*1935*), *No. 1*, *p. 76*, *fig. 1*).—In a device reported from the Ohio State University, the water jacket consists of a top cut from a bottle of suitable size and placed in an inverted position, the stem of the funnel passing through one hole of a two-hole rubber stopper wired into the neck of the bottle top. A glass or metal tube passes downward from the second opening in the stopper and is bent upward to the top of the water jacket and downward over the edge of the jacket to dip into the water surrounding the funnel. Heating the lower part of the circulation tube produces convection currents adequate, if the tube be from 8 to 10 mm in diameter, to maintain the desired temperature in the water (or salt solution) about the funnel. Attention is called to the possibility of using Büchner funnels as well as the ordinary 60° glass funnels.

A micromethod for the determination of sodium, A. P. WEINBACH (*Jour. Biol. Chem.*, *110* (*1935*), *No. 1*, *pp. 95–99*).—A contribution from the Johns Hopkins University describes a micromethod for the determination of sodium in 0.1 cc of serum, plasma, or whole blood, in 0.5 cc of a 1:5 trichloroacetic acid serum or plasma protein-free filtrate, or in 1 cc of a 1:10 trichloroacetic acid whole blood or cell protein-free filtrate. The method is adaptable also to the determination of sodium in other biological material, such as urine or feces.

The method is based on the precipitation of sodium in an alcoholic medium as the triple salt uranyl zinc sodium acetate. Subsequently, the precipitate, which is entirely soluble in water, is titrated with sodium hydroxide, the reaction depending on the formation of the amphoteric hydroxides of uranium and zinc.

Rapid method for determination of small amounts of arsenic, C. E. LACHELE (*Indus. and Engin. Chem.*, *Analyt. Ed.*, *6* (*1934*), *No. 4*, *pp. 256–258*, *figs. 3*).—A method for the determination of arsenic by estimating the evolved arsine deposited upon a mercuric bromide-impregnated diaphragm is given, and is shown to be applicable for estimating minute quantities of arsenic in the presence of such impurities as iron, tin, antimony, or reducible sulfur and phosphorus compounds. Modifying the procedure somewhat made it possible to determine the arsenic content of an undigested sample of many products.

The arsine evolved from the reaction mixture containing zinc activated by previous treatment with a hydrochloric acid solution of stannous chloride, together with ferrous, or ferrous ammonium sulfate and hydrochloric acid, is carried by a current of nitrogen or hydrogen through a vertical condenser provided with a cotton plug saturated with a solution of cuprous chloride in hydrochloric acid, through a Milligan absorption bulb containing the same cuprous chloride solution, and thence through a small circular diaphragm or filter paper disk which is impregnated with mercuric bromide and is held between the abutting ground ends of two pieces of glass tubing brought together in a jacket of rubber tubing. After the evolution and absorption of the arsine, the absorption disk is placed in a 20 percent solution of cadmium iodide until all the mercuric iodide formed is dissolved out. The disk is then washed with water, dried between blotters, and compared with a series of stains prepared from solutions of known arsenic content.

"For minute amounts of arsenic the method is especially applicable, as the entire digest of a sample can be used. With a disk 20 mm in diameter 0.001 to 0.04 mg of arsenic trioxide can be directly determined."

The determination of iodine in biological material, V. Trevorrow and G. J. Fashena (*Jour. Biol. Chem., 110 (1935), No. 1, pp. 29–38, fig. 1*).—A contribution from Cornell University reports a critical study of a method based upon the oxidation of the organic matter with sulfuric acid and chromium trioxide in the presence of a very small proportion of cerous sulfate (the catalyst insuring the conversion of all the iodine to iodic acid), followed by a reduction with arsenious oxide, steam distillation of the liberated iodine, reoxidation with bromine, and estimation of the iodic acid by treatment with potassium iodide and titration with thiosulfate.

Three sources of error in this basic procedure were discovered and were corrected by suitable modification: "First, it was found that arsenic could frequently be demonstrated in the distillate by means of the Marsh test. The arsenic acid formed from this by subsequent bromination liberates iodine in the final titration, thus leading to grave errors. Secondly, when substances containing appreciable amounts of chloride (blood) were digested with chromic and sulfuric acids, a large amount of chromyl chloride was formed, of which traces invariably distilled over into the absorber. This gave rise to the yellow color and was also found to be responsible for the slow liberation of the excess iodine in the final titration. Furthermore, even in the absence of appreciable chromyl chloride it could be demonstrated that vigorous distillation caused the transfer, by entrainment, of enough chromium to interfere with the final titration. In the third place, it was found that the large amount of acetic acid which formed during the digestion of organic material later distilled into the alkaline absorber, interfering with the sensitivity of the titration because of two factors—the high salt concentration and the buffer action of the residual potassium acetate."

To overcome these difficulties, phosphorous acid was substituted for arsenic trioxide as the reducing agent. The chromyl chloride and acetic acid were both removed by introducing a boiling period after digestion, and errors due to entrainment were overcome by the inclusion of a Kjeldahl bulb in the apparatus.

Some iodine-containing samples of chromium trioxide were difficult to purify. Potassium dichromate was substituted and was "found to be ideal for the purpose. It is inexpensive, easily purified, and because of its slow conversion to chromic acid in the digestion flask it appreciably diminishes the intensity of the reaction."

Rapid method for quantitative determination of carbon in organic compounds, C. B. POLLARD and W. T. FORSEE, JR. (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 1, p. 77, fig. 1*).—In an apparatus reported from the University of Florida, a built-in dropping funnel allows the addition of the oxidizing mixture without opening the flask, the carbon dioxide is determined gravimetrically, and an aspirator is used to pull air through the apparatus. Satisfactory and consistent checks with the theoretical percentage of carbon are said to have been obtained. Figures are given.

Organic soil carbon by reduction of chromic acid, L. E. ALLISON (*Soil Sci., 40 (1935), No. 4, pp. 311–320*).—This contribution from the Illinois Experiment Station records the results of a critical examination of the Schollenberger method (E. S. R., 65, p. 504) for determining soil organic carbon by the reduction of chromic acid. Modifications of this procedure by other investigators were found less desirable than the original, "since they have impaired one or more of its desirable features, namely, simplicity, rapidity, or accuracy." Compared to furnace combustion, Schollenberger's method was shown to offer the following advantages: (1) It is approximately 50 percent more rapid, (2) it is unaffected by the presence of carbonates in the sample, and (3) it does not determine inert carbon.

As an example of the advantage of a method unaffected by the presence of inert carbon is stated the result of an analysis of a sample of soil taken close to a railroad right of way and showing some 21 percent more "organic" carbon in the combustion method than was found by the Schollenberger method. Physical examination of a sample showed the presence of cinders and unburned coal particles. Another sample, from a point 200 ft. from the railway, yielded practically the same result when examined by either method.

Though more accurate than the combustion method for soil samples containing inert carbon, the Schollenberger method was shown to require a correction of the directly determined figures in that "the conditions of time and temperature of oxidation by chromic acid reduction give uniformly incomplete oxidation of soil organic carbon. A conversion factor of 1.15 is required to bring carbon values by this method into agreement with furnace combustion data. The analytical error of the reduction method, although slightly greater than that of the furnace combustion method, is shown to be less than the error in a commonly accepted method of sampling; hence the accuracy of this method is adequate for the purpose intended."

Research on shortening time without affecting the accuracy of Dyer's modified method for the determination in soils of phosphoric acid, lime, and potash soluble in citric acid solution (1 per cent), J. A. BONNET and F. A. VILLAMIL (*Jour. Dept. Agr. Puerto Rico, 17 (1933), No. 4, pp. 287–300*).—The Dyer method was investigated at the Puerto Rico College Experiment Station with the purpose of shortening the time without affecting the accuracy of the modified method for the determination in soils of phosphoric acid, lime, and potash soluble in 1 percent citric acid solution. A shortened method for the lime determination, based on the Chapman method (E. S. R., 61, p. 414) for the precipitation of calcium oxalate in acid solutions (pH 3.9–4.2) in the presence of iron, aluminum, titanium, manganese, magnesium, and phosphates, is recommended. A short method is recommended for the phosphoric acid determination. Results are analyzed statistically by the Student method. Several of the colorimetric methods recommended for the phosphoric acid determination are also discussed.

A comparison of potassium permanganate and ceric sulfate for the oxidation of cobaltinitrite in the estimation of potassium in KCl solution

and in ammonium acetate soil-extracts, H. C. Harris (*Soil Sci., 40 (1935), No. 4, pp. 301–309*).—Preliminary experiments made in connection with an investigation in progress at the Delaware Experiment Station indicated that in the Schueler and Thomas method (E. S. R., 74, p. 297) there is a possibility of using ice-cold distilled water for the wash solution, and that alcohol may not be necessary. Talc with a fritted glass funnel seemed to be better for filtration than an asbestos pad. "The Schueler and Thomas method is reliable for the determination of potassium in the ammonium acetate leachate of Sassafras silt loam soil, if duplication of results and the recovery of potassium added to the leachate are considered measures of reliability."

A procedure for the determination of potassium by means of ceric sulfate is given. A comparison between 17 determinations of potassium in a KCl solution by means of potassium permanganate and 16 determinations on the same solution by means of ceric sulfate was made, the potassium equivalent factors being essentially the same.

The ammonium acetate extracts of Sassafras silt loam, Chester loam, and Norfolk sand were analyzed for potassium by both methods. There was close agreement in all cases. Known amounts of potassium added to some of the leachates were recovered reasonably well, indicating that both methods are reliable for the determination of small amounts of potassium in these soil extracts.

"In some respects ceric sulfate seems to be preferable to potassium permanganate for potassium determinations [especially in the matter of sharpness of titration end point, in which respect the new method described would appear to have been distinctively superior]."

A simple method of estimating exchangeable calcium and other bases in noncalcareous soils, A. N. Puri (*Soil Sci., 40 (1935), No. 5, pp. 383–390*).—According to the data obtained by the author, a simple method of estimating exchangeable calcium and other bases in noncalcareous soils consists in shaking a known weight of the soil with 0.1 N oxalic acid in N ammonium acetate. The whole of the calcium is precipitated as oxalate, and the decrease in the concentration of the oxalate ion is equivalent to the exchangeable calcium in the soil. Under the experimental conditions described, all the exchangeable bases other than calcium passed into solution as acetates or oxalate. A known volume of the filtrate is evaporated to dryness and ignited, when these bases are obtained as carbonates and are determined by titration with standard acid.

The composition of the tissue proteins.—I, The estimation of purines in tissues, S. Graff and A. Maculla (*Jour. Biol. Chem., 110 (1935), No. 1, pp. 71–80, fig. 1*).—This paper reports upon "the first of a series of experiments on the composition of the tissue proteins in relation to the anatomy and physiology of the cell." Suitably prepared tissue samples could be sufficiently hydrolyzed in a mixture of 10 N formic acid and N hydrochloric acid, the quantity of hydrochloric acid present being somewhat more than equivalent to the free amino groups of the protein dealt with, without destruction of the purines, of which quantitative recoveries could be made. An aqueous suspension of cuprous oxide was found the best precipitant for the purines thus liberated.

The iodometric determination of cysteine, T. F. Lavine (*Jour. Biol. Chem., 109 (1935), No. 1, pp. 141–145*).—The author finds that if the concentrations both of hydrochloric acid and of potassium iodide be increased to molar the liability of other methods (depending upon the oxidation of cysteine to cystine by iodine and upon the subsequent titration of the excess iodine) to an error due to oxidation beyond the disulfide stage is eliminated, together with the inconveniences of holding the temperature of the solutions at 0° C. and of carrying out the excess iodine titration immediately and rapidly. Under the conditions specified, the indirect iodometric determination of cysteine in M HCl and KI at room temperature was shown to yield results consistent with its oxidation to cystine.

"In M HI the changing of the amount of excess I_2 from about 10 percent to over 1,000 percent, by varying the cysteine concentration, was . . . found to be without effect on the results, which are moreover . . . constant over a period of 3 hr."

The electrometric titration of lecithin and cephalin, T. H. Jukes (*Jour. Biol. Chem., 107 (1934), No. 3, pp. 783–787, fig. 1*).—In an investigation reported from the University of California mixtures of lecithin and cephalin were titrated electrometrically in 98 percent ethanol. "Cephalin was found to bind alkali and to have a pK′ value of 8.9. Lecithin did not bind alkali. Both phospholipides bound acid at low values of pH and had pK′ values of about 1.1. These observations indicate that lecithin and cephalin form zwitter ions."

Equilibria of the basic amino acids in the formol titration, M. Levy (*Jour. Biol. Chem., 109 (1935), No. 1, pp. 365–381, figs. 5*).—"A unified systematic treatment of the equilibriums between dibasic amino acids and formaldehyde has been developed and applied to arginine, histidine, and lysine. Only the amino groups are considered as reacting with formaldehyde, each of them reacting with 1 or 2 molecules of formaldehyde successively." The stoichiometry of each amino acid in the formol titration (E. S. R., 19, p. 808) with reference to its equilibriums is discussed.

Determination of malic acid in plant tissue, G. W. Pucher, H. B. Vickery, and A. J. Wakeman (*Indus. and Engin. Chem., Analyt. Ed., 6 (1934), No. 4, pp. 288–291*).—It has been shown at the Connecticut [New Haven] Experiment Station that "malic acid, when oxidized by potassium permanganate in the presence of potassium bromide, is converted into a bromine compound that is volatile with steam. This substance combines with dinitrophenylhydrazine in acid solution to yield a product insoluble in water which can be filtered off and dissolved in pyridine. The pyridine solution, when diluted with water and made alkaline with sodium hydroxide, promptly develops a blue color suitable for spectrophotometric measurements, strictly proportional to the quantity of malic acid taken over the range 0.1 to 2.5 mg, and stable for several hours." The same product was formed both from optically active and from optically inactive malic acid.

"A method, based upon this reaction, has been developed to determine the malic acid content of dried leaf tissue, or of extracts from leaves, and has been applied to tobacco leaf. Preliminary experiments have shown that it can readily be adapted to the investigation of the malic acid content of muscle, blood, and urine, and also to the determination of aspartic acid after this has been deaminized with nitrous acid."

Application of the glass electrode to dairy products, L. R. Parks and C. R. Barnes (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 1, pp. 71, 72*).—An investigation reported from the Pennsylvania State College has shown that the H-ion concentration of dairy products may be determined by the glass electrode, the quinhydrone electrode, or the hydrogen electrode with an accuracy which is within experimental error. A decided drift occurred when platinum electrodes were used with quinhydrone, especially in ice cream mix and butter serum. This drift was eliminated by the use of gold electrodes, however.

The stick antimony electrode data were from 0.307 to 0.646 pH units higher than those from the glass electrode. The errors appeared to increase with high concentration of serum solids and with the lactic acid content. The effects upon the stick antimony electrode of solutions containing citric acid, lactic acid, and lactose are emphasized. "Since citrate and lactate ions form complexes with antimony in solution, it seems probable that a similar complex formation takes place at the surface of the antimony electrode. As a result the electrode does not measure the true H-ion concentration of the solution."

Tests for the presence of sugar and salt in milk and cream, F. J. Doan (*Penn. Assoc. Dairy and Milk Insp. Ann. Rpt., 10 (1934), pp. 47–55*).—In a discussion contributed from the Pennsylvania Experiment Station two tests are recommended as being of use in connection with recent legislation requiring additions of sugar or salt to certain classifications of milk and cream. One is the so-called "resorcinol-hydrochloric acid test" for ketones "which, if used properly and with understanding, will indicate the presence of added sugar in milk or cream." The other is the silver nitrate titration method for indicating added salt in milk or cream. "The results of this test are to be interpreted on the basis of the normal maximum limits for chlorides in milk and cream.

"While there are some objections to these tests when applied to individual cow's milk or to milk from small herds, nevertheless when they are used for milk and cream made up from a comparatively large number of herd sources and for the purposes here stated the objections become practically negligible. It is therefore believed that these tests will give satisfactory results in the uses intended."

Determination of butter fat in the presence of coconut oil, F. F. Flanders and A. D. Truitt (*Indus. and Engin. Chem., Analyt. Ed., 6 (1934), No. 4, pp. 286, 287*).—A modification described in a contribution from the Massachusetts State Purchase Laboratory, where it has long been in use in controlling the composition of oleomargarine which contained 10 percent of butterfat and a similar proportion of coconut oil, "reverses the regular procedure in that it avoids the second distillation and operates directly upon that portion of the fatty acids precipitated by silver. Also, the use of silver nitrate as the silver salt insures quick and clean precipitation."

A qualitative test for enzymes of the trypsin and papain types, J. B. Sumner and S. F. Howell (*Jour. Biol. Chem., 109 (1935), No. 1, pp. 429–431*).—Finding such combinations of dyes with fibrin as have been used in testing for the presence of pepsin to be unsatisfactory as a means of testing for proteases acting in neutral solutions or at higher pH values, the authors of this contribution from Cornell University devised a test dependent upon hide powder containing barium sulfate precipitated within its pores. When this material is acted upon by proteases, the barium sulfate is liberated and goes into suspension upon shaking. This combination has been shown to be satisfactory for the detection of all proteases attacking proteins of high molecular weight, insofar as these enzymes have been examined.

"With the hide powder-barium sulfate a positive test is given by 1 mg of Fairchild's 1:3,000 trypsin at pH 7.0 at room temperature in 1 min. One mg of Park, Davis 1:3,000 pepsin at pH 2.0 gave practically no test for 4 hr., but large quantities of pepsin gave a test rapidly. Fig tree protease, taka-diastase preparation, papain-cysteine, and bromelin-cysteine gave positive tests at pH 5.0 very rapidly. Extract of green malt and a commercial saccharase preparation gave positive tests at room temperature at pH 4.1 only after about 1 hr. As little as 0.001 mg of Fairchild's trypsin gave a positive though faint test after incubation with the hide powder at 37° [C.] overnight. For some unexplained reason the rate of digestion decreases very rapidly with small amounts of trypsin."

Full manipulative detail of the preparation of the new substrate and of the carrying out of the test are given.

The chemical determination of minute quantities of vitamin C, D. Glick (*Jour. Biol. Chem., 109 (1935), No. 1, pp. 433–436*).—A method for the estimation of vitamin C, which is reproducible to ±0.0001 mg, is described. "It is suitable for determination of the vitamin C content of extremely small amounts of material, including microtome sections of tissue [two sections 20μ thick or one of 40μ]."

AGRICULTURAL METEOROLOGY

On developing long-range weather forecasting (*Bul. Amer. Met. Soc., 16 (1935), No. 10, pp. 236, 237*).—In an interchange of views between C. F. Brooks and H. H. Clayton, the two were in agreement on the following points with reference to long-range weather forecasting:

"The effort to find fixed periods of constant phase and amplitude in the weather (other than diurnal and annual periods) has been attended with little success. . . . Many investigators have found similarities in the weather changes at stations widely separated on the earth's surface. Some of these changes are of the same character and some are opposed to each other." This fact seems to have some significance in relation to weather forecasting and has been used for this purpose by certain meteorologists. Further investigation should be made of whether certain centers of action in the atmosphere, as, for example, the area of low pressure in the North Atlantic, the high over the Middle Atlantic, and the high in northeastern Siberia, can be related to changes in physical condition of the earth's surface, such as changes in temperature of the ocean, in accumulated ice and snow in high latitudes, or to changes in solar activity. "It is desirable that investigation of the relation between solar changes and the weather be continued. Studies of the physics of the air in regard to the movement of different air masses, as practiced by the Bergen school of meteorologists, and in regard to the absorption, reflection, etc., of solar heat and of terrestrial radiation as embodied in the studies of the Smithsonian Institution, of Humphreys, Dines, Simpson, and others are important and promising lines of investigation in this field as well as in regard to day-to-day weather changes."

An application of the theory of tropopause waves to weather forecasting, I. P. Krick (*Bul. Amer. Met. Soc., 16 (1935), No. 10, p. 225*).—In an abstract of this paper, presented at the Washington meeting of the American Meteorological Society, the author states that "recent investigations, concerning the relation between pressure and temperature fluctuations in the troposphere and oscillations of the tropopause, show that in the higher levels of the troposphere, low temperatures are associated with a warm, low tropopause, and high temperatures with a cold, high tropopause."

A possible predictive factor for Florida air temperatures, G. Slocum (*Bul. Amer. Met. Soc., 16 (1935), No. 10, pp. 221, 222*).—From a study of Caribbean water temperatures and temperatures of the air in Florida, the author concludes that "the variations in northwestern Caribbean water-surface temperatures are probably modifying influences on Florida winter air temperatures in an inverse sense. The sign of the anomaly in the Florida air temperature for a given winter season can be predicted with better than chance accuracy for at least seven months in advance." He suggests that "this is a step in the direction of long-range forecasting, and further analyses may reveal additional significant predictive factors."

[Temperature distribution in Pennsylvania], H. LANDSBERG (*Bul. Amer. Met. Soc., 16 (1935), No. 10, p. 220*).—In an abstract of a paper, presented at the Washington meeting of the American Meteorological Society and dealing primarily with "three temperature maps for Pennsylvania based on a normal period of 1871 to 1930 with values reduced to sea level for January, July, and the whole year", the author states that "while the July map shows simply increasing temperature toward the south with a cooling effect of the ocean in the utmost eastern part of the State, the January map reveals a warming effect of the Great Lakes and two heat islands in the southeastern and southwestern counties. The map for the whole year shows that Greene County, Fayette County, and parts of York County are the warmest parts of the State."

Climatological data for air conditioning (*Bul. Amer. Met. Soc., 16 (1935), No. 10, pp. 241, 242*).—Reference is made to the marked increase in the use of air conditioning equipment in the last few years, and to the publication by the U. S. D. A. Weather Bureau of tabulations of certain values especially needed for air conditioning engineering and operation.

"The most generally required values are the so-called 'degree days.' The number of degree days for heating or winter air conditioning for a month is determined by totaling the daily deficiencies in the mean temperature (maximum plus minimum divided by two) relative to 65° F. The totals should be computed for all those months in which some or all the days have mean temperatures below 65°. The base value of 65° has been determined empirically and is generally agreed on by engineers."

Degree days for cooling, A. D. MARSTON (*Bul. Amer. Met. Soc., 16 (1935), No. 10, pp. 242–244*).—It is stated that " 'degree days' are fairly well established as a basis for estimating heating costs and are now to be included in monthly meteorological summaries. With the growing use of air conditioning, there rises a question concerning the possibility of using some similar guide to cooling costs. Unfortunately there are not enough data available to justify the final selection of such a guide. Those who have such information available should cooperate to the end that a satisfactory basis may be developed."

SOILS—FERTILIZERS

[Soil and fertilizer investigations by the Illinois Station] (*Illinois Sta. Rpt. 1934, pp. 15–26, 27–30, 32–40, figs. 13*).—Results of studies by R. S. Smith, E. E. DeTurk, R. H. Bray, J. C. Anderson, F. C. Bauer, H. J. Snider, O. H. Sears, and L. E. Allison are noted under the following captions: Soil survey provides basis for land-use policies; why soils grow old revealed by long-time studies; impervious subsoil found in two general situations; drainage water gives valuable crop information; land use and adjustments rest on soil productivity; stable agriculture impossible on impoverished soils; simple soil systems best in times of low prices; manure value set at $4 an acre a year in long test; use of limestone stabilizes farm yields and income; phosphates prove profitable only in some cases; potassium, lodging preventive, raises grain quality; and lack of potassium found to cause low corn yields.

[Soil investigations by the Wisconsin Station] (*Wisconsin Sta. Bul. 430 (1935), pp. 51–57, figs. 2*).—Data are reported under the following captions: Potash, not water, limits crop yields on marsh soils and fertiliser experiments at the Peninsular Substation, both by A. R. Albert; field trials show benefits from fertilizing canning peas, by F. L. Musbach; deep tillage fails to increase potato yields at Rice Lake, by Musbach, F. W. Duffee, and J. G. Milward; soil acids help to make rock phosphate available to plants, by R. L. Cook and E. Truog; and improve methods of studying soil colloids, by M. Drosdoff and Truog.

New soil series established in 1933, C. F. Shaw (*Amer. Soil Survey Assoc. Bul. 15* (*1934*), *pp. 16, 17*).—"There is submitted herewith a list of the names of the soil series correlated and established since the submission of the last list 1 yr. ago. The list includes 94 names, 11 from the Province of Saskatchewan in Canada, 77 from the United States, and 6 from East Africa. These, with the 2,197 series names already listed with our association, make a total of 2,291 soil series that have been definitely and officially established in various parts of the world."

Standards in soil type correlation, M. Baldwin (*Amer. Soil Survey Assoc. Bul. 15* (*1934*), *pp. 18, 19*).—The author of this short discussion, contributed from the U. S. D. A. Bureau of Chemistry and Soils, points out that "no doubt the ideal standard for a soil type would be a natural soil section established by authority, custom, or general consent as representative of a particular soil classification unit or type and exposed for examination in place." He recognizes, however, that "since it seems impracticable for everyone concerned to be constantly running to selected soil profiles to refresh his knowledge of particular soil standards, it is necessary to reproduce or describe our standards in such a way as to permit a rather general dissemination of the salient features of the standard profile. This can be accomplished by (1) securing monolith samples of the profiles or section samples with as little disturbance as possible of the natural soil characteristics, (2) securing selected samples of the various natural soil layers or horizons, (3) reproduction by photography, (4) reproduction by sketches or drawings which may be more or less conventionalized, (5) written description, (6) memory or mental imagery." The relative values of these various methods and the use of one to supplement another are briefly analyzed.

Soil pore-space, A. Smith (*Amer. Soil Survey Assoc. Bul. 15* (*1934*), *p. 20*).—Noting a certain degree of confusion in terminology, the author of this contribution from the University of California suggests that "in order to obtain a more universally accepted usage, . . . the term soil pore space be used to express the total pore space of the soil mass regardless of the proportions of air or water that may occupy these pores, that soil air space be used to express that portion of the soil pore space occupied by air, and soil moisture space be used to express that portion of the soil pore space occupied by water. It is further recommended that these all be expressed as percentage of the total volume occupied by the entire soil mass, which method of expression is most used at the present time in soil physics, whether reference is made to soils in their natural state in the field or to any described artificial condition in the laboratory."

Soil temperature apparatus for field work, G. A. Mail (*Soil Sci.*, *40* (*1935*), *No. 4*, *pp. 285, 286*, *fig. 1*).—The soil thermometer unit of an apparatus devised at the Montana Experiment Station is described as consisting, essentially, of a 15-in. length of $\frac{3}{16}$-in. copper tubing, hammered at one end to a tapering point and containing a well-insulated 28-gage constantan wire passing through a filling of insulating compound and welded into the point of the tube. The filing of $\frac{1}{8}$- or $\frac{1}{4}$-in. divisions on the copper tube permitted the depth to which it had been forced into the ground to be read conveniently. A copper wire was soldered to the open end of the tube, and the copper and constantan wires were protected by rubber tubing to a distance of from 1 to 2 ft. from the tube. A cold junction and potentiometer completed the equipment. "With this apparatus it is possible to measure a temperature gradient in most situations involving soil temperature much more speedily than is possible by the use of the standard soil thermometer in general use."

A suggested scheme for mapping rough stony land or steep stony mountain areas, H. W. Higbee (*Amer. Soil Survey Assoc. Bul. 15 (1934), p. 53*).—The method suggested in this contribution from the U. S. D. A. Bureau of Chemistry and Soils is described, in part, as follows: "(1) Choose a number or map symbol to represent all areas of rough stony land. . . . (2) In order to differentiate the soil material of the rough stony areas suffix to the rough stony land symbol the soil number that is used for that particular soil profile wherever found irrespective of the stone content. . . .

"In the final publication of maps a similar procedure could be followed, only that a given color could be used to designate all areas of rough stony land, thus eliminating the additional cost of using different colors to show different kinds of soil materials. To designate the different soil materials within the rough stony areas it is suggested that the map symbols which are used to designate a given soil be engraved on the rough stony land color." Illustrative examples of these procedures are given.

An informative legend for soil maps, C. F. Shaw (*Amer. Soil Survey Assoc. Bul. 15 (1934), pp. 7–9*).—Of the use in soil maps of color areas and alphabetically arranged lists of literal symbols, the author of this note from the University of California says, in part, that "they may be made very much more expressive and made to carry much additional information by adding a few interpretive lines and by rearranging the blocks of color in conformity to simple classification schemes."

Referring to a legend for the Auburn area, Calif., presented as illustrative material, he further states that "the most inclusive categories place the soils in two groups—the primary soils formed by residual weathering from hard rocks, the secondary soils formed by weathering from unconsolidated materials that have been transported and deposited by water as alluvial fans and broad alluvial plains. Each of these categories is again divided on the basis of degree of leaching and character of weathering, where the latter is known. Both noncalcareous and calcareous soils, or Pedalfers and Pedocals, occur in each area, and some of the soils show definite trend in weathering that can be recognized as lateritic in character. Surveys in other regions would show similar trends that might be podsolic or chernozemic, or might fit into some other 'climatic' class that can be indicated."

Soil survey trends in Java, R. L. Pendleton (*Amer. Soil Survey Assoc. Bul. 15 (1934), pp. 73–75*).—The author indicates, in a brief discussion contributed from the University of the Philippines, the general nature of the methods used, respectively, by the Institute of Soil Technology and the Experiment Station of the Java Sugar Industry in mapping the soils of Java. The first named agency "is following the 'American' method, supplementing it by mineralogical and chemical laboratory determinations." The sugar experiment station, "to insure more precision and uniformity in the absence of other means of compilation, employs a method using more exact laboratory measurements of color and heaviness."

Soil survey of the Lovington area, New Mexico, W. G. Harper and L. H. Smith (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpt.], Ser. 1932, No. 2, pp. 21, figs. 2, map 1*).—The Lovington area, of 841,600 acres and located in Lea County in southeastern New Mexico, forms part of an extensive high plain and, "within the area surveyed, . . . is very flat treeless grassland that is almost unbroken in relief by dissecting streams or noticeable ridges. In the eastern part of the area a few spots are characterized by a billowy dune-like surface relief." But three soil series are represented (Springer, Lea, and Reagan), the two types of greatest extent being Springer fine sandy loam, 9.8 percent of the tract surveyed, and Lea loam, 8.7 percent. Scab land occupies 59.9 percent of the area and is used only as pasture land.

The survey was made in cooperation with the New Mexico Experiment Station.

Notes regarding soils and vegetation in southwestern Wyoming, T. W. Glassey (*Amer. Soil Survey Assoc. Bul. 15 (1934), pp. 12–15*).—A brief contribution from the U. S. D. A. Bureau of Chemistry and Soils calls attention to the fact that Uinta County not only represents the soils and vegetation of southwestern Wyoming but also "has the great soil groups of those found in temperate latitudes." These soil groups are described, together with the vegetation characteristic of each in the county under discussion.

Characteristics indicating differences in maturity in soils of the semiarid regions, A. T. Sweet and R. D. Hockensmith (*Amer. Soil Survey Assoc. Bul. 15 (1934), pp. 34–38*).—A cooperative investigation by the U. S. D. A. Bureau of Chemistry and Soils and the Colorado College of Agriculture has shown that factors other than precipitation influence the development of soils in semiarid regions, some of the more important of these additional factors being temperature, length of seasons, vegetation, humidity, and air movement.

"Soils in the semiarid regions studied are characterized by (1) a grayish brown surface mulch 1 to 2 in. thick, (2) a darker brown or reddish brown cloddy zone, roughly columnar in the lower part, (3) a lighter colored zone usually heavier in texture, (4) a zone of lime accumulation, and (5) a zone with less lime, usually lighter in texture. The zone of lime accumulation seems to be the best index of the stage of development ranging from only small deposits to thick beds of caliche.

"In the region studied, mature soils which have developed under approximately the same rainfall, by which the aridity of a region is often judged, have been so dominated by other factors that they have a wide range in color and in development of the lime zone. The color ranges from dark colored soils, only slightly removed from the chernozems, with a moderately developed lime zone in northern Montana to distinctly reddish brown soils with highly developed caliche in central-west Texas and grayish brown desert soils with hard, thick caliche only a few inches below the surface in southern New Mexico."

Some characteristics of mature soils in Michigan, J. O. Veatch and C. E. Millar (*Amer. Soil Survey Assoc. Bul. 15 (1934), pp. 42–44, figs. 2*).—A contribution from the Michigan Experiment Station summarizes the types of mineral soil profiles found in Michigan in the three classes, (1) profiles having B horizons (more inorganic colloids than in C), (2) profiles not having B horizons, and (3) profiles having "brown" or "ortstein" horizons, each class being more or less subdivided. Some new soil analyses are recorded in tables showing a comparison of soil profiles on young and on old land surfaces, analyses of profiles exhibiting a "gray" horizon, and molecular ratios, $\frac{SiO_2}{Fe_2O_3+Al_2O_3}$ in both B and C horizons of several Michigan soils.

The so-called solonetz soils of California and their relation to alkali soils, W. P. Kelley (*Amer. Soil Survey Assoc. Bul. 15 (1934), pp. 45–52, fig. 1*).—The author of this discussion, contributed from the University of California, takes up the probable derivation and the various assigned meanings of the terms "solonetz" and "solonchak" and considers also the evolution of alkali soils in terms of the stages of salinization, alkalinisation, desalinization, and degradation.

The author finds that "the salinization and alkalinization stages overlap and are so inextricably interwoven as to make impossible their separation. This is true for the reason that base exchange takes place immediately upon contact with soluble sodium salts. Therefore, the salinization and alkalinization stages develop synchronously. If the soil contains soluble calcium salts, de Sigmond's alkalinization stage will never be reached. Very large areas of California alkali soils are of this kind, the Imperial Valley area being a typical example. Moreover, if calcium carbonate be present, the degradation stage will also fail to materialize under leaching conditions, even though there be no water-soluble calcium salts in the soil, owing to the fact that calcium carbonate will react with the very first hydrogen soil particles that are formed by hydrolysis, with the consequent development of calcium saturated particles, which is the stable and normal form for soils. Therefore, the desalinization process can lead to the degradation stage only if the soil is practically free from soluble calcium salts or calcium carbonate. Only negligible areas of such soils occur among the extensive areas of the alkali soils of America. These soils are predominantly calcareous, and among them the extensive development of solodi is not to be anticipated."

He concludes that "all of these various evolutionary stages represent alkali soil, and that an understanding of the various processes to which alkali soils are subjected in the state of nature, and the properties that they must inevitably acquire in consequence, will be promoted by a recognition of these various stages in their evolution. Just as there is no sharp line separating a saline from a nonsaline soil in the early stage of the salinization process, neither is there a sharp line separating them at the close of the desalinization process. It seems to me that the definition of alkali soil, as soil which contains either an excess of water-soluble salts or replaceable sodium, is satisfactory for all practical purposes."

Observations on the morphology of solonetz soils in north-central Nebraska, E. A. Nieschmidt (*Amer. Soil Survey Assoc. Bul. 15 (1934), p. 70 fig. 1*).—In the course of the work of the Nebraska State Soil Survey, the author observed, in several counties of the Prairie Plains region of north-central Nebraska, certain soils of a distinct and unusual morphology which is here briefly indicated.

"These formations are intrazonal and hydromorphic in character and are mostly of the solonetz type. However, they are unique in that they are sandy solonetz in contrast to the clayey ones commonly described in soil literature."

A chemical study of soil development in the Peorian loess region of Illinois, R. H. Bray (*Amer. Soil Survey Assoc. Bul. 15 (1934), pp. 58–65*).—The purpose of the study here reported from the Illinois Experiment Station was to subject the classification based on observable features to a chemical examination "and to establish, if possible, chemical criteria of soil development in addition to the physical criteria already in use." In part, the observations recorded are as follows:

"Two main types of secondary materials are produced and retained in the soils studied, the concretionary material and secondary silicates.

"The concretionary material is characterized by free oxides of Fe and Mn and by occurrence as splotches or soft to hard concretions scattered throughout all horizons of all profiles. Free oxides of iron may also occur with the colloidal silicates, especially in the well-drained profile. This material increases in amount with maturity. Its presence affects to only a slight degree the dominant chemical and physical properties of the soil.

"The second type of material occurs mainly in the colloidal condition in all horizons as iron and aluminum silicates of magesium and potassium. The portion finer than 1μ contains most of this material. These secondary silicates have many properties in common with the isomorphous series of which beidellite, Al_2O_3, $3SiO_2$, nH_2O, and nontronite, Fe_2O_3, $3SiO_2$, nH_2O are end members, and also with sericite, a potash clay. Colloidal material starts forming early in the weathering process before the carbonates have been leached away, and its period of greatest formation and downward movement occurs before the soil has developed any marked acidity. Its distribution in the profile as a result of movement is a function of the topography and drainage, and its rate of movement in the early stage varies with the type of vegetation.

"The break-down of some of the coarse-sized colloid particles gives a finer colloid lower in potassium and higher in magnesium and iron than the residual coarser fraction. The downward movement of these finer particles produces a corresponding change in composition of the whole colloid. This leaves the surface soil colloid lower in iron and magnesium and higher in potassium, while it lowers the potassium content and increases the iron and magnesium content of the whole colloid of the accumulative horizon (II or B). The SiO_2/R_2O_3 ratio of the silicates remains unchanged during this break-down. The greatest ease of break-down of the silicate particles which are higher in iron and magnesium in contrast to the higher aluminum-potassium colloid is responsible for the effects obtained. The possibility of the break-down to colloidal size of original parent minerals and their occurrence in the colloid is recognized. If this has occurred, only original minerals with an SiO_2/R_2O_3 ratio of 3.0 have done this to any significant extent. . . .

"The processes of soil development in the soils studied and, therefore, the production of individual soil types have been in great part a matter of the formation, the break-down to smaller sizes, and the movement and the accumulation of the silicate colloids as modified by other soil-forming factors."

The structure of soils as affecting soil erosion, J. F. LUTZ (*Amer. Soil Survey Assoc. Bul. 15 (1934), pp. 98–100, figs. 2*).—A much eroded North Carolina soil, the Iredell sandy clay loam, was compared with Davidson clay, a soil not especially subject to erosion. It is stated that "the greater percolation of water through the Davidson soil as compared with the Iredell is due to several factors: First, the Davidson is more highly aggregated; second, a high percentage of the aggregates in the Davidson are larger than those in the Iredell; and, third, there is a difference in the type of aggregates. Because more water percolates through the Davidson there is less run-off, and, consequently, less erosion. Also, the larger size of the effective particles in the Davidson makes them less subject to dispersion and erosion."

The Storie index method of soil evaluation, C. F. SHAW (*Amer. Soil Survey Assoc. Bul. 15 (1934), pp. 10, 11*).—A note from the University of California outlines the method of calculating the Storie index (E. S. R., 70, p. 157), and, while pointing out that the index is a rating of the soil factor only, not a complete land evaluation, calls attention to the fact that in attempting the evaluation of land "guesses as to soil conditions, based on a look at growing crops or native cover, are usually very unreliable and often misleading. For Federal Land Bank loans, which may run 20 to 35 yr., the soil factor must be properly evaluated in making the land appraisals." In this latter connection, it is further noted that "the Storie index method is being used in California by the assessors in several counties and by appraisers for the Federal Land Bank and other financial institutions. In the Imperial Valley, where the climate, water supply, transportation, markets, and conditions other than those inherent in the soil are all quite uniform, the index rating becomes essentially a land evaluation."

State land use programs, L. L. Lee (*Amer. Soil Survey Assoc. Bul. 15 (1934), pp. 85–87, figs. 2*).—An outline analysis of State land use programs, contributed from the New Jersey Experiment Stations, briefly discusses a number of topics, including the objectives and procedure of such programs, the soil inventory (in general), the New Jersey soil inventory, present use of land for all purposes, use of land for agriculture, the State land use program soil conservation, readjustment of land use and agricultural practice, marginal land, and undeveloped land.

Land use and the soil survey in Illinois, R. S. Smith (*Amer. Soil Survey Assoc. Bul. 15 (1934), pp. 32, 33*).—In speaking of the State Soil Survey, the author of this contribution from the Illinois Experiment Station discusses three points which he feels "must be kept in mind if the Soil Survey is to continue to grow in effectiveness as rapidly as it should and remain in a position to render increasingly valuable service." These three cardinal considerations are stated, in part, as follows: "(1) There must be full and complete cooperation between all of those interested in soil investigations. The Soil Survey proper must of necessity identify and map the various soil units. This work is preliminary in nature, and if carried no further is of little value. The properties of each soil unit must be investigated by laboratory methods, and its existence as a soil unit confirmed or denied. If confirmed, its present and potential producing capacity and adaptation must be determined by experiment field and other methods. (2) Our experience in Illinois is that an understanding of geological relationships is necessary for an understanding and interpretation of soil conditions. . . . (3) The problem of the correlation of soils is a matter of constant concern. In the past we have of necessity based our correlations largely on observable characters, and in the process memory has played a rather important part. We are of the opinion that correlation must receive more attention, and that one of the first steps in improving the present unsatisfactory situation is to establish type sections, or definite locations where the profiles may be taken as standards for the types described."

Crop distribution in relation to soil types in southeastern Ohio, A. H. Paschall and G. W. Conrey (*Amer. Soil Survey Assoc. Bul. 15 (1934), pp. 66–68, figs. 2*).—In order to investigate the use being made of the land in southeastern Ohio, a number of areas varying in size from 1 to 4 sq. miles, in which the soils were representative of a large area, were selected. Soil maps showing the nature of the cover in a general way and of the crops being grown on each field were prepared. "In this latter work air photographs, where available, serve a very useful purpose in giving the outline of the fields. . . . Although it is recognized that there may be a considerable error introduced because of the small area considered, still it is believed that the method of study furnishes much valuable information at a minimum expenditure of time and money."

Some of the influences of soils upon farming in southwestern Oklahoma, A. W. Goke and C. A. Hollopeter (*Amer. Soil Survey Assoc. Bul. 15 (1934), pp. 54–57, fig. 1*).—"This article attempts to describe the effects of soils upon farming in southwestern Oklahoma according to our observation in the field in soil survey work. It covers only a few counties of southwestern Oklahoma, namely, those of Greer, Kiowa, Tillman, Jackson, and Harmon. However, it is hoped that it may serve to increase an interest in continuing the study of soils and agriculture in this part of the State."

Relation of crops to soil types in Wisconsin, A. R. Whitson (*Amer. Soil Survey Assoc. Bul. 15 (1934), pp. 25–28*).—A brief discussion contributed from the University of Wisconsin notes that while the dairy type of farming, general in Wisconsin, leads to the growing of a group of crops some of which are not well adapted to certain soil types, nevertheless there is much opportunity to effect economy in dairy production by the recognition of soil type character. "Moreover, we grow important amounts of several cash crops which can yield better returns when their relations to fundamental soil characteristics are realized."

National objectives in the utilization of peat land in agriculture and industry, A. P. DACHOWSKI-STOKES (*Amer. Soil Survey Assoc. Bul. 15 (1934), p. 29*).—Noting that "considerable attention is now being given to peat land utilization through regional organization, since desirable economic adjustments for a land type generally spoken of as 'marginal' or 'submarginal' must needs be made from the standpoint of a region coordinated as a whole," the author of this contribution from the U. S. D. A. Bureau of Chemistry and Soils discusses briefly the possibilities for the agricultural and other utilization of certain major peat land groups of the United States.

The chemical and biological nature of certain forest soils, W. L. POWERS and W. B. BOLLEN (*Soil Sci., 40 (1935), No. 4, pp. 321–329, pl. 1*).—Data presented in a contribution from the Oregon Experiment Station indicate the maximum absorptiveness for moisture, maximum adsorptiveness or base-exchange capacity, and the maximum number of micro-organisms and macro-organisms to have been found in the fermenting layers, which contain approximately 75 percent of organic matter. Artificial mixtures of organic and inorganic soil colloids, varied in composition by 20 percent intervals, showed a corresponding base adsorption curve.

"The earthworms and related macro-organisms serve as colloid mills" to generate an intimate mixture of fine organic and inorganic matter. "Feeding roots are massed in forest soils in or just below this organic layer. . . . Active organic matter may increase the soluble iron and perhaps phosphorus in the soil solution."

Forest soil fertility studies, W. L. POWERS and W. B. BOLLEN (*Amer. Soil Survey Assoc. Bul. 15 (1934), p. 24*).—The results of an investigation carried out at the Oregon Experiment Station indicated that in DeKalb and Upshaw forest soil profiles from Pennsylvania and of Olympic and Aiken soil profiles from the Oregon State College, the organic matter and nitrogen extend deeper in the western Oregon profiles, the maximum nitrogen content in each of the forest soil profiles being found approximately at the F-H boundary zone; and that base-exchange capacity also reaches a maximum at about this zone, where the major part of the colloidal material is organic and intimately mixed with a minor proportion of inorganic soil colloids. DeKalb soil appeared more aged and lower in base-exchange capacity than the others.

Nitrate supplying capacity, the fertilizer needs of various tree species on the soils investigated, and certain of the microbiological characteristics of these soils are also very briefly noted.

The effect of wind blown road dust on soil reaction and composition, G. H. ENFIELD and S. D. CONNER (*Amer. Soil Survey Assoc. Bul. 15 (1934), pp. 71, 72, fig. 1*).—The authors (Indiana Experiment Station) present a considerable body of data showing "the difficulty in securing a representative soil sample near roads that are or have previously been calcareous and dusty", and indicating the effect of road dust on soil reaction and composition. As an example of the observations recorded, a Lawrence silt loam, when sampled at 50 ft. and at 300 ft. from a road, yielded 2.94 and 0.32 percent of calcium oxide soluble in strong hydrochloric acid at the shorter and the greater distance, respectively; 0.036 and 0.008 percent of phosphoric anhydride soluble in 0.2 N nitric acid; 0.14 and 0.10 percent total nitrogen; no lime requirement and a lime requirement of 2,720 lb. per acre by the Jones method; pounds of phosphorus according to the Truog method (E. S. R., 64, p. 312), more than 200 lb. per acre and 20 lb. per acre; and pH values of 7.8 and 5.2, respectively. Among other data given are the pH values and available phosphorus contents of 22 samples of 7 soil types sampled at 50, 100, 200, 300, and 400 ft. in a specified direction from a road, the material of which is also specified in each case.

Some plant and soil-moisture relations, F. J. VEIHMEYER and A. H. HENDRICKSON (*Amer. Soil Survey Assoc. Bul. 15 (1934), pp. 76–80, figs. 2*).—An investigation reported from the University of California has yielded data showing the constancy of the permanent wilting percentage under widely different evaporating conditions.

"The results mentioned here indicate that the permanent wilting percentage represents a definite soil-moisture condition that is remarkably constant for any given soil under any evaporating condition likely to be obtained with plants growing in the field. Therefore the importance of surface forces in the soil in causing the wilting of plants is suggested." It is further pointed out that "the exhaustion of readily available moisture is generally indicated by drooping or curling of the leaves, but in some plants this effect is not obvious. In such cases it is necessary to look for other indications of lack of readily available water such as change of color of leaves, or a marked decrease in the rate of growth of the plant or fruit. In some cases, however, the reduction of the moisture to the permanent wilting percentage for short periods does not result in any apparent changes in the plant. Therefore, it is essential to know how long the plants lack readily available moisture. Such terms as 'lightly irrigated', 'heavily irrigated', 'kept at optimum', 'high', 'medium', and 'low' moisture plats are meaningless because they do not give the essential information necessary to interpret the soil-moisture conditions."

A device for measuring precipitation waters lost from the soil as surface runoff, percolation, evaporation, and transpiration, G. W. MUSGRAVE (*Soil Sci., 40 (1935), No. 5, pp. 391–401, pls. 3, fig. 1*).—After a brief analysis of the shortcomings of lysimeter systems previously described, a set-up devised at stations of the U. S. D. A. Bureau of Chemistry and Soils is presented, with working drawings and photographs of various stages in the construction and manipulation; and the manner in which the failings of earlier designs are overcome is shown.

Cylinders 3 ft. in diameter and 3 ft. deep are gradually forced into the soil in such a manner as to preserve not only the soil structure but also the original vegetation and the original slope. The filled cylinders are placed upon drainage-collecting bases of cement in which the soil column rests upon a layer of fine gravel which, in turn, lies upon a layer of coarse gravel, both gravel layers having previously been washed with hydrochloric acid and then with distilled water. Surface outlets take care of surface run-off, and the supplementary rain gages are placed with their tops at a height the same as that of the soil cylinders.

Sorption of liquids by soil colloids.—II, Surface behavior in the hydration of clays, L. D. BAVER and H. WINTERKORN (*Soil Sci., 40 (1935), No. 5, pp. 403–419, fig. 1*).—Having shown in a previous investigation (E. S. R., 72, p. 450) that the sorptive behavior of different soil colloids is related to the structure of the colloidal complex, to the amount and nature of the ions adsorbed on the surface, and to the electrical properties of the molecules of the sorbed liquid, the authors of this contribution from the Missouri Experiment Station here discuss the rate of water sorption by colloidal clays and such properties of clay-water systems as viscosity, charge, hygroscopicity, heat of wetting, and swelling, "in order to permit a clearer concept of the role of surface behavior in the hydration of colloids.

A study of the influence of the structure of soil colloids and of the amount and nature of ions at the surface on such colloidal properties as sorption of liquids, heat of wetting, viscosity of suspensions, ζ potential of the dispersed particles, hygroscopicity, and hydration was made. On the basis of the experimental data obtained, hydration is explained as due mainly to the orienting influence on dipole molecules of the colloid surface as well as of the adsorbed cations. In the cases of certain colloids (bentonite and alkali-saturated organic matter) an osmotic type of swelling appeared to play a significant role.

The importance of the shape of the primary and secondary colloidal particles with respect to the evaluation of swelling from sorption data is stressed, and the principal swelling theories are discussed in their relation to the data and conclusions of this particular study.

The easily soluble iron, manganese, and aluminum in Illinois soils, R. H. BRAY (*Amer. Soil Survey Assoc. Bul. 15* (*1934*), *p. 69*).—In a preliminary note on a study of the forms in which the elements named occur in relation to soil-type development, in progress at the Illinois Experiment Station, the author reports determinations of the quantities of iron, manganese, and aluminum extracted from soils with a neutral salt solution, a dilute sulfuric acid solution, and sodium acetate solutions varying in pH, together with the manganese content of corn plants growing on some of the soils studied.

Manganese was found to be readily extracted with all solutions, while iron and aluminum were extracted in significant amounts only with solutions of pH 5 or below.

Observations on the distribution of the elements named in two profiles are very briefly indicated.

Chemical nature of organic matter in different soil types, S. A. WAKSMAN and I. J. HUTCHINGS (*Soil Sci., 40* (*1935*), *No. 5, pp. 347–363*).—Observations made in the course of an investigation in progress at the New Jersey Experiment Stations show that there is a rather wide range of variation in the composition of the humus of different soil types and considerable variation even within the type. The following is a partial statement of the results thus far obtained:

"Humus in podsols is characterized by a high cellulose, a high hemicellulose, and a low protein content. Because of a lack of bases in these soils, the two major constituents of the humus, namely, the lignin and protein, are readily dispersed in the water and are carried down to the lower horizons, where they are precipitated, in the presence of greater base concentration. One need not assume the existence of 'humic acids' and 'crenic acids' in order to explain the movement of specific organic complexes in the process of podsolization. This process can be much better understood when consideration is given to the mobility of the specific chemical constituents of humus under different soil and environmental conditions.

"The humus of the tchernozems is characterized by a narrower carbon-nitrogen ratio, which is nearly 10:1, by a high content of lignin and protein, and by a lower cellulose and hemicellulose concentration. The humus in these soils is fixed because of the abundance of bases, namely, calcium and magnesium.

"The humus in chestnut soils approaches in its chemical composition that of the tchernozems; it stands midway between these and the serozems. In view of the fact, however, that only one soil belonging to this type was analysed here, no broad conclusions can be drawn.

"The humus of the serozems is characterized by a narrow carbon-nitrogen ratio of about 6:1. This is due to the relatively high protein content of this type of humus. Cellulose is completely absent. Hemicelluloses are either absent or present in very low concentrations. Lignins are present, but in somewhat lower amounts than in tchernozems.

"As one proceeds from the podsols to the serozems, one finds the following gradual changes in the chemical composition of the humus: (1) A rapid disappearance of the cellulose and hemicelluloses, due to more active decomposition processes; (2) a rapid increase in the nitrogen content of the humus, because of the synthesizing activities of the micro-organisms, accompanying the reduction of the carbohydrates; (2) the narrowing of the C:N ratio, based upon the preceding two phenomena; (4) a gradual reduction in lignin content, due to its greater decomposition.

"Considerable variation was found among soils belonging to the same general type. Care must, therefore, be exercised in basing definite conclusions upon a large number of soils belonging to each soil type."

Micropedological studies of the influence of different organic compounds upon the microflora of the soil, W. Kubiena and C. E. Renn (*Zentbl. Bakt.* [*etc.*], *2. Abt., 91 (1935), No. 11–15, pp. 267–292, pls. 3, figs. 2; Ger. abs., pp. 290, 291*).—The term "micropedological studies" is used in this contribution from the New Jersey Experiment Stations "as a shorter expression for 'direct microtechnical investigations of undisturbed, naturally developed soils.' Their goal is not only the microscopic investigation of the microscopic elements that make up the soil but the performance of chemical and biological operations in this system. Since it is important to know how the separate soil constituents are arranged and how they are combined to form the natural soil, the observation of undisturbed soils is indispensable. This method also affords the only possible means of studying biological conditions of the soil spaces in situ. As with the morphological features, the processes operating in the soil are magnified so that many single activities taking place in the smallest spaces become observable. . . .

"It is easily possible to see the soil spaces with the aid of a vertical light microscope magnified to such a size that individual treatment of the small objects and substrates inside, as well as the micro-organisms growing on them, is possible. As in micrurgy, which reached high development in general biology, all manipulations are performed under the microscope with the aid of special microtools, particularly micro-needles, micropincers, micropipettes, microlances, etc. These manipulations are generally so simple that the use of a micromanipulator and of other appliances used in the fine work of micrurgy (glass tools instead of resterilizable metal parts) can for the most part be dispensed with."

By means of a technic of the type indicated a study of the various groups of soil organisms was made, their behavior both in the unmodified soil and in samples to which had been added cellulose, lignin, zein, or gum arabic having been observed.

Of the new technic developed, it is concluded that the direct methods will not be able to supersede the plate and cultural methods, but that they represent an addition to the former methods which cannot be dispensed with. "The future of soil investigation will require a combined application of all methods."

Microbial activities in soil.—II, Activity of specific groups of microbes in relation to organic matter transformation in Palouse silt loam, S. C. Vandecaveye and M. C. Allen (*Soil Sci., 40 (1935), No. 4, pp. 331–343, figs. 4*).—An investigation carried out at the Washington Experiment Station, extending previous work (E. S. R., 72, p. 163), resulted in the following, among other, observations:

"During the first stages of decomposition of the organic residue in the soils the rate of CO_2 evolution was not a true measure of the numbers of active microbes, as the former was most profuse during the first days whereas the latter did not reach their maximum numbers until about 5 weeks later." The bacteria as a group took the lead but were followed closely by the actinomyces and fungi.

The activity of the cellulose decomposing bacteria and *Azotobacter* never attained important proportions. The largest numbers were reached after the activity of the three other groups had subsided. The repeated field applications of straw and nitrogen fertilizers did not affect either CO_2 evolution or microbial activity to an appreciable extent. The water-soluble substances contributed by the straw were decomposed largely in 37 days. The bacteria, because of rapid increase and superiority in numbers, were responsible for the major part of this decomposition. The hemicellulose and cellulose compounds decomposed at a uniform rate during a period of approximately 80 days. The bacteria and actinomyces, as well as the fungi, took an important part in the decomposition of these products.

In the process of decomposition, the protein content of the organic matter was steadily built up "as a result of the rapid loss in carbohydrate materials and synthesis of protoplasm" by the micro-organisms.

"The relative amounts of lignin in the treated soils increased gradually, indicating that the major part of the lignin compounds supplied by the straw were not attacked by the micro-organisms during the course of the experiment."

Nitrification studies with soil types in northern Puerto Rico, J. A. Bonnet (*Jour. Agr. Univ. Puerto Rico* [*Col. Sta.*], *19* (*1935*), *No. 2, pp. 73–103*).—The results of experiments carried out at the station indicate that ammonium sulfate should not be used as a source of nitrate for plants in the Lares clay loam, Sabana Seca clay, and Catalina clay, and in some fields of Múcara silty clay loam, unless these soils be suitably limed. An application of diammonium phosphate, with a broadcasting of lime, appeared to be a better treatment for Lares clay loam than the use of ammonium sulfate. "Although the lime might be beneficial in the Lares clay loam and Catalina clay, it should also prove advisable, in those soils and in Sabana Seca clay, to apply part of the nitrogen as nitrate salts, preferably calcium nitrate."

Ammonium sulfate nitrified quite well in the Toa silt loam, Coto clay light texture phase, and Espinosa clay, even in the absence of lime. The application of ammonium sulfate as a source of nitrate for plant growth seemed likely to prove beneficial in these soils without lime broadcasting.

Mathematical relations between total exchange capacity and absorption of ammonium and potassium by soils, J. F. Fudge (*Soil Sci.*, *40* (*1935*), *No. 4, pp. 269–284*).—Of 5 mathematical equations expressing the relations between total exchange capacity and the absorption by soils of ammonium and potassium from solutions of ammonium sulfate and potassium sulfate, studied at the Texas Experiment Station, "the equation $y=KC^{1/p}$ [in which y represents the quantity taken up by the soil, C represents the quantity in solution at equilibrium, and K and p are constants determined experimentally] gave values which are in best accord with the values determined experimentally. The value of K, when divided by the total exchange capacity, T, gave a quotient which was fairly similar for all soils. It indicated, however, significant differences in the absorptive capacity of some soils per unit of exchange complex. The values of p were practically constant for all soils. The equations best fitting the general data were $y=0.0648\ TC^{0.77}$ for ammonium and $y=0.0851\ TC^{0.77}$ for potassium."

The availability of soil potassium, J. Lamb, Jr. (*Soil Sci., 40 (1935), No. 5, pp. 365–381, fig. 1*).—At the [New York] Cornell Experiment Station on a Ewing soil, high crop yields from which were maintained only by the addition of potassium, fertilization with this element increased the amount of exchangeable potassium until the added potassium had been utilized by the crop. The B_1 soil layer contained much more adsorbed potassium than the A_1 or A_2. No relation between the total and exchangeable forms of soil potassium was found. Fertilization did not affect the exchangeable potassium of the A_2 or B_1 layer or the exchangeable calcium of the B_1 layer. Potassium starvation in the Ewing soil was associated with low exchangeable potassium and high exchangeable calcium. The methods used showed no significant difference in the rate at which exchangeable potassium and the water-soluble potassium were replenished from the reserve supply of the soils. In the cases of the soils here discussed there appeared to be little relation between response to potassium fertilization and either the exchangeable or the water-soluble potassium.

The addition of sugar to a soil high in nitrates reduced the nitrate level, reduced the level of electrolytes, and slightly increased the exchangeable potassium.

Significance of minor plant foods, L. G. Willis (*Natl. Fert. Assoc. Proc., 10 (1934), pp. 113–115*).—This note from the North Carolina Experiment Station constitutes a general review and discussion of plant nutrients, including balanced fertilizers and minor nutrients such as calcium, magnesium, manganese, and sulfur.

Commercial fertilizers report for 1935, E. M. Bailey (*Connecticut [New Haven] Sta. Bul. 377 (1935), pp. 59+IX*).—In addition to the usual tabular statement of the results of the inspection analyses, this bulletin contains a brief discussion of compost materials, potting soils, etc., which are sometimes sold as fertilizers, "but since they generally do not contain plant food in excess of 1 percent of nitrogen, phosphoric acid, or potash, they are not recognized as fertilizers subject to registration." The bulletin also lists the definitions of fertilizer materials and interpretations of terms which have thus far been made official.

AGRICULTURAL BOTANY

Investigations in plant metabolism, II [trans. title] (*Deut. Forsch., No. 23 (1934), pp. 268, figs. 5*).—In this second contribution[1] on plant metabolism, discussions of the following subjects are given, including summaries of the results of the authors' own investigations:

Problems of cell physiology.—Investigations of stimulatory substances in plants (relation to protoplasmic streaming and to movements in mimosa) and the influence of light on the permeability of protoplasm to solutions, both by H. Fitting; the physiology of metabolism in the green algae, by M. Roberg; and the migration of substances in the plant organism, by W. Schumacher.

Assimilation of carbon dioxide.—Investigations of carbon dioxide assimilation in green plants, including the native plant world (assimilation with environmental factors constant, daily march of assimilation under natural conditions, assimilation with carbon dioxide fertilization, assimilation in plants under adaptation to cold or to warm temperatures, and greenhouse experiments with carbon dioxide fertilization and artificial illumination at night), and desert plants, by R. Harder; carbon dioxide assimilation under constant environmental conditions, by A. Arnold; chemical and biological investigations of chlorophyll formation and of chlorophyll-like bacterial pigments ((1) chlorophyll—chemical studies, biological studies of the conversion of protochlorophyll into chlorophyll, studies of chlorophyllase, and of the differing stability of chlorophylls a and b in biological chlorophyll decomposition; (2) bacterial chlorophyll), by K. Noack.

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[1] Deut. Forsch., No. 8 (1929), pp. 128.

The water economy of plants.—The physiology of littoral, dune, and halophytic plants (comparative studies of the salt tolerance and salt content of various plants, halophytes, and culture experiments with mangrove seedlings), by W. Benecke; investigations of the problems of water economy in plants, by H. Fitting; and contributions to the knowledge of bleeding phenomena in maples, by H. R. Bode.

Nitrogen metabolism.—Nitrate exchange and storage in the higher plants, and investigations of the origin of allantoin in plants, both by W. Ruhland; the localization of protein synthesis in green leaves, and the wilting of flowers, both by W. Schumacher; and investigations of protein metabolism, by K. Mothes.

The metabolism of acids.—The problem of the origin of organic acids in the green plants, by K. Wetzel; the acid metabolism of succulent plants in general, and of the succulent Crassulaceae, both by W. Ruhland; and the problem of malic acid synthesis in the Crassulaceae, by K. Wetzel.

Dissimilation and related phenomena.—The determination of the respiratory quotients and their physiological significance, and supplementary investigations of the respiratory quotient, both by E. G. Pringsheim et al.; the death of plants with oxygen deficiency, by W. Ruhland; and contributions to the kinetics of carboxylase activity, and the carboxylase system in the green leaf, both by K. Wetzel.

The relationship of plant life to the chemical factors of the environment.—Chemicobiological and experimental investigations of natural waters and their associations of organisms, by V. Czurda; of the relationship of the life of higher plants to soil acidity (the action of distilled water and of iron, zinc, aluminum, and boron salts on the roots, the influence of nutritive salts on the action of H-ion concentration and vice versa, the action of ammonium salts in relation to H-ion concentration, and nitrite as a nitrogen source), by W. Mevius; and investigations of the effects of ions on plants, by H. Fitting.

Mycological and bacteriological questions.—The fixation of free nitrogen by fungi and bacteria, and investigations of *Pseudomonas tumefaciens* and Actinomycetes, both by W. Benecke; investigations of nitrite bacteria, by H. Engel; the action of iron, zinc, and copper on the Aspergillaceae, by M. Roberg; and investigations of the Mitscherlich-Baule law of action in cultures of *Aspergillus niger*, and of the nutrient content of the soil by the "*Aspergillus* method", both by H. Söding.

Respiration, W. Stiles (*Bot. Rev., 1 (1935), No. 7, pp. 249–268*).—The author reviews the outstanding investigations of the preceding 5 yr. on respiration in a variety of plant species and in different plant organs at various stages of development, including discussions of new methods, the influence of external conditions and of respiratory substrate on respiratory activity, variations in respiratory activity during development, the respiratory quotient, anaerobic respiration, and the relation of rate of carbon dioxide output to rate of loss of substrate. Although no spectacular results have been attained, our knowledge has materially advanced both as to the relationship of respiration to external and internal conditions and as to the respiratory mechanism. A literature list of 47 titles is included.

The chlorophyll content of leaves of barley mutants [trans. title], H. v. Euler, H. Hellström, and D. Burström (*Hoppe-Seyler's Ztschr. Physiol. Chem., 218 (1933), No. 5–6, pp. 241–248, figs. 3*).—Chlorophyll determinations were made on the first leaves of 7-day seedlings of normal, and Albina, Xantha, and Alboxantha mutants of barley. The former gave a normal curve of distribution of the chlorophyll content expressed as the ratio of the pigment to the weight of the leaf. The normal (green) mutants contained as much chlorophyll per gram of fresh weight as normal barley, but the defective (chlorophyll-poor) mutants varied greatly among several lines in addition to containing only a fraction of as much pigment as the other mutants.—(*Courtesy Biol. Abs.*)

Synthesis of sucrose in plant tissue, A. I. Virtanen and M. Nordlund (*Biochem. Jour., 28 (1934), No. 5, pp. 1729–1732*).—Sucrose (about 6 percent of the dry matter of the leaves) was synthesized from both glucose and fructose when leaves of red clover and wheat plants previously kept in the dark for 24 hr. were placed in 10 percent solutions of these hexoses for further 24 hr. in the dark.

Interconvertibility of glucose and fructose in plant tissue, M. Nurmia (Nordlund) (*Nature* [*London*], *135* (*1935*), *No. 3409, p. 345*).—Experiments with several species of grasses and legumes have confirmed the assumption, based on previous work (see above abstract), that glucose and fructose are interconvertible in plant tissues.

Production of ethylene by plant tissue as indicated by the epinastic response of leaves, F. E. Denny and L. P. Miller (*Contrib. Boyce Thompson Inst., 7 (1935), No. 2, pp. 97–102, fig. 1*).—In this preliminary paper, experimental results are given as showing positive responses with the fruits of 9 species of plants, in the seeds of 2, in the flowers of 1, in the crown and leaves of 1, in the leaves of 4, in the leafy stems of 1, and in the young shoots or stems of 1 species. Of these, the young potato plant proved to be the best for testing epinastic responses.

A number of plant tissues tested, including fruits, stems, leaves, roots, and flowers, did not cause epinasty of leaves, but it was found that a tissue giving no epinasty could acquire that capacity by contact with a tissue that induced such a response.

These epinastic responses do not give full proof that ethylene is produced by the tissue or that it is the sole factor in these effects, but there are strong reasons in favor of this theory.

Can nitrogen fixation by germinating legume seeds occur without the aid of nodule bacteria? [trans. title] K. Girtschanoff (*Zentbl. Bakt.* [*etc.*], *2. Abt., 92 (1935), No. 13–19, pp. 349–363*).—The author carried out a series of experiments with germinating yellow lupine and pea seeds to determine whether, under the influence of various stimulants (metal salts, alkaloids, and carbon monoxide gas), they could assimilate elemental nitrogen directly without the aid of the nodule bacteria as recently claimed by Vita (E. S. R., 70, pp. 455, 456) and apparently confirmed by B. J. Haritantis (1934). However, in the experiments here reported no taking up of elemental nitrogen by the germinating seeds could in any case be demonstrated, and the author attributes their results to errors in experimental set-up.

Carbon dioxide storage, VI–VIII, N. C. Thornton (*Contrib. Boyce Thompson Inst., 6 (1934), No. 3, pp. 395–405, fig. 1; 7 (1935), No. 2, pp. 113–118*).—In continuation of this series of studies (E. S. R., 70, p. 612), the following papers are presented:

VI. *Lowering the acidity of fungal hyphae by treatment with carbonic acid* (pp. 395–402).—*Sclerotinia fructicola* was grown on liquid and solid potato dextrose media at six temperatures from 2° to 28° C. and subsequently exposed to various concentrations of carbon dioxide with 20 percent oxygen. The pH of the hyphae was determined by indicators and by capillary-glass and quinhydrone electrodes. The carbon dioxide increased the pH value of the living hyphae from 5.6 to 7.2.

Since increased alkalinity is more unfavorable for the fungus growth than increased acidity, it is suggested that the growth retardation induced by carbon dioxide is occasioned by the alkalinity developed within the hyphae as a result of its effect on the metabolism of the living cells.

VII. *Changes in flower color as evidence of the effectiveness of carbon dioxide in reducing the acidity of plant tissue* (pp. 403–405).—The effectiveness of carbon dioxide in increasing the pH value of living tissues was demonstrated by the change in the color of the anthocyanin present in the cells of flower petals of rose, verbena, peony, and iris. This change in pH value in the petals during treatment was shown also by pH determinations made on the juice extracted from the petals, using the quinhydrone electrode.

VIII. *Chemical changes in potato tubers resulting from exposure to carbon dioxide.*—The author reports the beginning of a study of the effects of carbon dioxide on the chemical processes in living tissues to elucidate the means by which the various changes already observed are induced. To this end, Green Mountain potato tubers were treated with different concentrations of carbon dioxide in the presence of 20 percent of oxygen for various periods up to 21 days at 21° C. Increases in the rate of respiration and in the specific conductivity of leachings from the tissue were observed. Furthermore, the catalase activity, pH value, reducing sugar, and sucrose in the extracted juice were greatly increased over the controls, and a slight increase was noted in its reducing properties.

Initiation and stimulation of roots from exposure of plants to carbon monoxide gas, P. W. ZIMMERMAN, W. CROCKER, and A. E. HITCHCOCK (*Contrib. Boyce Thompson Inst., 5 (1933), No. 1, pp. 1–17, figs. 6*).—Carbon monoxide gas was found to induce definite rooting responses of some kind in 27 and root initiation in young stem tissues in 10 out of a total of 80 species of plants tested. Some of the species responded by producing roots from a short zone on the stem representing approximately the region of elongation at the time treatment began, while 1 species produced roots only from the flower stems. On older stems carbon monoxide stimulated growth of preexisting root primordia. Root stimulation by the gas treatment ocurred in 18 species, and 7 of them tended to root especially at the nodes. Modifications of the normal orientation of soil roots to gravity were induced in 9 species. Root hairs were more abundant following treatment. There was some evidence that roots were slightly retarded in further elongation by carbon monoxide after they had penetrated the epidermis. Tobacco cuttings from the tips of plants exposed to the gas grew large root systems in 5 days, as against 15 days in the controls. Leafless cuttings produced roots like those on the stems of potted plants when similarly treated with the gas, but leafy cuttings produced more roots than those without leaves.

Since in these experiments no other organs were induced to form by the carbon monoxide, it appears that this gas is specific for adventitious root formation.

The effect of carbon monoxide on plants, P. W. ZIMMERMAN, W. CROCKER, and A. E. HITCHCOCK (*Contrib. Boyce Thompson Inst., 5 (1933), No. 2, pp. 195–211, figs. 7*).—The studies noted in the preceding abstract also indicated many other responses of plants to carbon monoxide. The results of these and of additional experiments are here presented.

Of the 108 species treated, 45 showed epinastic growth of the leaves, and several showed hyponasty causing upward curling. Stem elongation in most of the species was retarded. New leaves produced during the gas treatment were of normal shape but abnormally small.

Injury was indicated by abnormal yellowing of the leaves, starting with the oldest, and abscission was usually associated with the yellowing. Hypertrophied tissues on the stems and roots of most species were induced by the gas. In many species an abnormally large number of side shoots arose from latent buds during recovery. Motion pictures indicated that carbon monoxide caused the leaves of *Mimosa pudica* to lose their correlation and to change their normal equilibrium to gravity. They also lost their sensitiveness to contact or heat stimuli, but moved about more rapidly. After treatment up to 24 hr. *Mimosa* plants recovered approximately to normal within a day.

"Since carbon monoxide causes growth rigor and loss of sensitiveness to external stimuli, it is here considered as an anesthetic. This conclusion was supported by the fact that animals which do not have hemoglobin were readily anesthetized by an 80 percent carbon monoxide air mixture of the gas."

Anaesthetic properties of carbon monoxide and other gases in relation to plants, insects, and centipedes, P. W. Zimmerman (*Contrib. Boyce Thompson Inst., 7 (1935), No. 2, pp. 147–155*).—The results here reported verify the earlier assumptions (see above) and extend the present knowledge of the anesthetic properties of carbon monoxide, carbon dioxide, propylene, butylene, ethylene, and acetylene when mixed with oxygen and tested on plants and on 10 species of insects and centipedes.

The lowest concentrations causing anesthesia in various insects and centipedes are given in percentages by volume. In preliminary tests they remained apparently normal in nitrogen or helium mixtures with the oxygen content as low as 2 percent. Butylene proved most toxic of the materials tested, the animals becoming paralyzed at concentrations much higher than necessary to cause anesthesia. Ethylene and acetylene were the least effective for insects and centipedes, being in a class with nitrogen and helium. This was in great contrast to their effectiveness on plants and mammals.

Ethylene was the most effective plant anesthetic, 0.0005 percent stopping growth movements of tomato and sunflower plants. Likewise, 0.001 percent stopped elongation of sweet pea seedlings, while 0.00001 percent retarded it nearly one-half. The degree of retardation in growth induced by ethylene gas varied with the concentration and the plant species. Acetylene and propylene were about equally effective as plant anesthetics, and both were about 10 times as effective as carbon monoxide. *Mimosa pudica* lost its capacity to respond to external stimuli during exposure to 0.25 percent of carbon monoxide, but became normal again on removal from this gas.

External and internal symptoms of boron deficiency in tomato, D. A. van Schreven (*Tijdschr. Plantenziekten, 41 (1935), No. 1, pp. 1–26, pls. 3; Eng. abs., pp. 22, 23*).—The symptoms of boron deficiency developed in tomato plants grown in water or quartz sand cultures and in plants that had been grown as seedlings in untreated quartz sand or even in rich leaf mold. Such symptoms were also induced in plants first grown for some time in water culture with added boric acid but afterward transferred to a solution lacking boron. Plants with distinct symptoms of boron deficiency were cured by the addition of boric acid. In the sand cultures treated with concentrated HCl, the symptoms developed earlier and more severely than in those with untreated sand.

Plants showing boron deficiency had, in sand cultures, upcurled leaf margins and those in water culture, for the most part, downcurled margins. Possible causes for this difference are suggested.

The internal symptoms and the course of the disintegrating process, as shown microscopically, are described in detail. The leaf curling is explained by the thickening of the interveinal tissues due to enlargement of the individual cells, with the veins remaining practically constant. The plastids do not decrease in number, but the chlorotic symptoms are due to their degeneration and decrease in size and to the increase in the volume of the cell contents.

Growth substances of the auxin and bios groups [trans. title], F. Kögl (*Ber. Deut. Chem. Gesell., 68 (1935), No. 1, pp. 16–28, pl. 1, fig. 1*).—The author reviews the previous work on the phytohormones, particularly that by himself and his collaborators, including data on the original materials, their necessary concentration, the structure of the crystallates, and their physiological activities. There is an extended discussion of the chemistry of auxin-a, auxin-b, and heteroauxin. In contrast to the cell stretching induced by the auxins, bios II, newly designated as biotin, is shown to be capable under certain conditions of increasing cell division by 1,400 percent and is here proposed as a phytohormone for cell division.—(*Courtesy Biol. Abs.*)

Coleoptile growth as affected by auxin, aging, and food, F. W. Went (*K. Akad. Wetensch. Amsterdam, Proc., 38 (1935), No. 7, pp. 752–767, figs. 9*).—In continuation of his studies of the relations between growth and growth-promoting substances (E. S. R., 64, p. 326), the author found by artificially increasing (from 10 to 50 times) the auxin concentration within a coleoptile that in normal growth auxin determines the growth rate of practically all cells, either directly as a growth promoter or indirectly by preventing aging. The aging is shown to be due to the rate of cell wall formation exceeding that of elongation so that the cell walls become stiffer. Rejuvenation was also demonstrated and shown to be a gradual increase in growth rate of old or aged cells after an excess of auxin has been applied. Cells which had stopped growing from the combined effects of aging and auxin deficiency resumed growth when given an excessive auxin supply.

A third factor influencing growth was recognized in the food factor, viz, the nutrients stored in the seed which induced increases in the growth of both leaf and coleoptile. Under normal conditions the food factor is present in relative excess, but it becomes limiting on application of excess auxin or on removal of the seed.

Effects of growth-promoting substances on the germination of seeds and on the formation of cork in potato tubers [trans. title], G. Borzini (*Bol. R. Staz. Patol. Veg.* [*Roma*], *n. ser., 15 (1935), No. 2, pp. 323–337, fig. 1; Eng. abs., p. 337*).—The growth substances from cultures of *Rhizopus suinus* and *Aspergillus niger* were studied as to their effects on the germination and development of wheat, oats, white mustard, clover, and fenugreek, and on cork formation in potato tubers. They generally had a negative action on the germination rate, but the total germinability (after 8 days) was not perceptibly influenced.

The initial development of plants grown in the presence of the highest concentration of growth substances tested or grown in distilled water after the seeds had been kept in this solution for 12 hr. was somewhat less than that of the controls, especially as to the root system. Removing a part of the wheat grain opposite the embryo and keeping such seeds for 15 hr. in the highest concentration tested resulted in a depression of the germination rate and root development, and in a positive but transitory effect on the aerial growth.

The growth substances influenced the formation of cork in cut potato tubers, the peptone-glucose solution after use as a medium for *Rhizopus* inducing a more abundant cork formation than in the controls not so treated.

Relative growth and dry weight production of plant tissue under Mazda, neon, sodium, and mercury vapor lamps, J. M. Arthur and W. D. Stewart.

(*Contrib. Boyce Thompson Inst., 7 (1935), No. 2, pp. 119–130, figs. 3*).—The growth and dry weight production of buckwheat plants were studied under neon, mercury vapor, and sodium vapor lamps in comparison with a 500-w Mazda lamp, and the Weston photronic cell was used to determine the points of equal light intensity.

Assuming the average dry weight per plant produced under the Mazda lamp as 1, the value for the neon lamp was 1.1, for the sodium vapor 0.9, and for the mercury vapor 0.66. Calculating the dry weights which might have been produced if equal amounts of energy in the visible region had been used, these values would be for the Mazda 1, for the sodium vapor 1.41, for the neon 1.2, and for the mercury vapor 0.62.

A consideration of the chlorophyll spectrum showed no relation between the emission bands of these lamps, the absorption bands of the chlorophyll pigments, and the efficiency of the various lamps in producing dry weight of plant tissue. The sodium lamp proved most efficient, with the main output of energy at wave length 588 and 589 mμ, where chlorophyll absorption is near the minimum. The neon lamp was second in efficiency with the main output band near the maximum of chlorophyll absorption in the red-orange region. The mercury vapor lamp was least efficient, yet had much of the energy output in the blue-violet region where chlorophyll absorption is at the maximum. The sodium lamp had an efficiency of 45 lumens per watt and the remarkably low power loss in the auxiliary transformer unit of only 25 w, as compared with a current consumption of 200 w in the arc itself. It therefore offers considerable promise as a cheaper and more efficient light source for growing plants. All gaseous discharge lamps produced greener leaves and a lower ratio of stems to leaves than did the Mazda lamp.

Fluorescence in citrus fruits induced by ultraviolet rays [trans. title], E. Bottini (*R. Staz. Chim. Agr. Torino Ann., 12 (1932–34), pt. A, pp. 253–270, pls. 7*).—The results here reported indicate that the cause of the diverse fluorescences exhibited by the various citrus fruits under Wood's light resides in the particular substances present in the essential oils of these fruits. These substances vary from species to species and give rise to fluorescences of different color. The chemical bases of these differences are discussed in detail for lemon, orange, mandarin, citron, bergamot, and grapefruit, and the phenomena are illustrated in color.

Recent developments in plant propagation, V. T. Stoutemyer (*Iowa State Hort. Soc. Rpt., 69 (1934), pp. 188–190*).—This is a contribution from the Iowa Experiment Station.

Macrosporogenesis and development of the macrogametophyte of Solanum tuberosum, O. L. Rees-Leonard (*Bot. Gaz., 96 (1935), No. 4, pp. 734–750, pls. 2*).—To elucidate, if possible, the usual lack of viable seeds in potato fruits, the author studied the macrosporogenesis and development of the embryo sac and here presents his detailed results.

The irregularities shown to occur during macrosporogenesis and during the development and maturation of the macrogametophyte may partially account for the failure of seed and fruit development. However, there seemed to be some correlation between the irregularities during microsporogenesis and the development of the pollen grains, on the one hand, and those during macrosporogenesis and macrogametophyte development in the ovules of the same flower, on the other hand. Further investigation may determine the relationships of these irregularities to the sterility so common in potatoes.

The shifting of periodicity by means of high temperatures: Adaptation, and export to the Southern Hemisphere, II [trans. title], A. M. Hartsema and A. H. Blaauw (*K. Akad. Wetensch. Amsterdam, Proc., 38 (1935), No. 7, pp. 722–*

734; Eng. abs., p. 734).—Continuing this series of studies (E. S. R., 69, p. 27), it was found that since daffodil flowers are completely formed within the bulb at the time of lifting the checking of their development could not be accomplished by the cold treatment used for tulip and hyacinth bulbs. The method here worked out for daffodils and recommended for all practical purposes consists in keeping the bulbs at a constant temperature of 28° C. (humidity 70 percent) from immediately after lifting until the end of February, when they are sent to the Southern Hemisphere.

A similar method worked out for hyacinths used 28° up to October 31 and 31° from then until shipping time. However, a high-temperature method for checking tulips has thus far not been evolved, and the cold method must continue to be used.

Comparative studies of the ash picture of the glumes of Chaetochloa, Panicum, Echinochloa, Sacciopsis, and Syntherisma [trans. title], M. Kondō and Y. Kasahara (*Ber. Ōhara Inst. Landw. Forsch., 6 (1935), No. 4, pp. 491–513, pls. 3, figs. 34*).—The results of this comparative study, illustrated with photomicrographs, further confirm the value of the ash picture in the differentiation and classification of plant materials.

A contribution to the study of some statistical problems in plant-sociology, P. Ottestad (*Nyt Mag. Naturv., 74 (1934), pp. 51–69*).—Statistical problems have arisen during recent years which the author believes have not yet been correctly solved, and two of them are here discussed.

Theoretical considerations have led to the view that the hypergeometrical frequency function can be taken as an approximate expression for the frequency distribution of the number of individuals of a species within test areas scattered over a larger field under study. The theoretical result has been verified by examination of an empirical series, and the premises for this agreement are pointed out. Attention is also called to the necessity of ascertaining in each case whether the agreement between the hypergeometrical frequency function and the empirical series actually exists, since it is not felt that this agreement is proved once and for all. If there is not this agreement, new problems arise as to the homogeneousness of an area in regard to the species the frequency distribution of which has been studied.

The frequency distribution of the number of species within test areas over a larger field is also discussed. Theoretical considerations led to the conclusion that the binomial frequency function can be taken as an approximate expression for such series. The premises of the agreement between this law and the empirical series here in question are as follows: The species are represented by an equal number of specimens within the area studied, and the frequency distribution of the number of individuals of a species within the test areas is approximately represented by the same frequency function as the frequency distribution of the number of individuals of any of the other species present. Undoubtedly, however, the actual facts in nature often do not agree with these premises.

Automatic flow-meter for drip solutions in plant nutritional studies, R. E. Wean (*Science, 82 (1935), No. 2127, p. 336, fig. 1*).—The author describes and figures a drip-nutrient apparatus for simultaneous use with a series of pots in plant nutritional studies. This apparatus requires no shifting of adjustments while refilling, provides a uniform flow of solution, permits the use of double-deck benches, lowers the labor of maintenance, is easy to clean, and is cheap in construction.

A new type of insulated greenhouse heated and lighted by Mazda lamps, J. M. Arthur and L. C. Porter (*Contrib. Boyce Thompson Inst., 7 (1935), No. 2, pp. 131–146, figs. 5*).—This refrigerator-type greenhouse with a 6-ft. growing bench was designed and built to use sunlight and Mazda lamps as sole sources of both light and heat, the lamps being operated by a thermostat set to maintain a temperature above 60° F. It was constructed of double sheet-metal walls soldered at the joints and filled in between the metal faces with dry sawdust, making it almost airtight so that additional concentrations of carbon dioxide could be maintained economically by the use of pieces of solid carbon dioxide.

The average daily amount of light supplied as a supplement to daylight was 4 hr., and except on cloudy days it was all supplied at night. This produced a rate of growth and flowering during winter, when the light intensity is lowest, which is believed equivalent to that in an ordinary greenhouse in March and April.

A method for imbedding plant tissues without dehydration, J. Dufrenoy (*Science, 82 (1935), No. 2127, pp. 335, 336*).—This note advocates the use of methylal ($CH_2(OCH_3)_2$) [=methylenedimethyl ester, formal, methylenedimethylate] as a dehydrating agent for plant tissues. It was found to preserve even the finer cell structures and to render the lignified tissues easily sectioned.

GENETICS

Genetics, H. S. Jennings (*New York: W. W. Norton & Co., 1935, pp. XIII+373, figs. 70*).—A presentation of the fundamental principles of genetics.

The backcross method in plant breeding, F. N. Briggs (*Jour. Amer. Soc. Agron., 27 (1935), No. 12, pp. 971–973*).—This contribution from the University of California describes how the backcross operates to bring about desired results.

Unstable genes, M. Demerec (*Bot. Rev., 1 (1935), No. 7, pp. 233–248*).—This review of results obtained in studies on gene changes as seen in visible effects upon the organism, particularly on stable genes, embraces 64 titles.

Associations of somatic chromosomes induced by heat and chloral hydrate treatments, F. H. Peto (*Canad. Jour. Res., 13 (1935), No. 5, Sect. C, pp. 301–314, pl. 1, figs. 34*).—The germination of O. A. C. 21 barley (*Hordeum vulgare*) at 35°–36° C. induced in the nuclei of the root tips numerous fractures in one or both chromatids, particularly in the attachment region of the chromosome, and the fractured ends appeared to possess an unsatisfied attraction for each other. Chiasmata were formed by the union at random of the fractured ends which happened to lie close together in the nucleus, giving rise to associations of one and one-half, two, and three chromosomes involving chromatid interchange or crossing over between nonhomologous as well as homologous chromosomes. The manner in which fragmentation, translocation, and elimination of chromosome parts can occur in somatic tissue is demonstrated, and somatic segregation and the incidence of new linkage relationships are discussed.

Formation of tetraploid and octaploid nuclei was induced in root tips of Arthur peas (*Pisum sativum*) by treatment with chloral hydrate. The chromosomes of these polyploid nuclei were frequently closely associated in pairs superficially resembling the paired associations observed in barley. The chromosomes, however, were never united by chiasmata and retained their juxtaposition solely through inability to separate normally at anaphase.

A genetic study of the inheritance of the various characters in certain Avena hybrids, P. J. R. de Villiers (*Union So. Africa Dept. Agr., Sci. Bul. 140 (1935), pp. 90, figs. [23]*).—In genetic studies with oats at the University of Stellenbosch, F_1 hybrids of Bancroft (late) × Boer (very early) oats, Bancroft × Sunrise (early), and Fulghum (early) × Boer oats, all were intermediate in maturity between the respective parents. F_2 segregation of Fulghum × Boer indicated a one-factor difference. Early and late segregates were of poor and good tillering capacity, respectively. The number of factors for earliness varied with the parents involved in the crosses.

Behavior of the crosses Bancroft × Boer oats and Bancroft × Sunrise supported the hypothesis of the presence of an inhibitor for hairiness of lemma, as stated by Florell (E. S. R., 66, p. 125).

The behavior of a number of hybrids indicated that different awnless and weak-awned pure-line selections were not always alike in genetic constitution. A cross between varieties with weak, straight awns, could produce progeny with strong awns, weak straight awns, and weak slightly twisted awns; and a cross between an awned and awnless variety could produce either awned and awnless segregates or an entirely-awned progeny.

In Bancroft × Sunrise, length of kernel appeared to be inherited in definite Mendelian ratios and was definitely proved to be constant for each variety or segregate. The inheritance of length of kernel appeared to be based upon the multiple factor hypothesis. The inheritance of width and depth of primary and also of secondary kernels in Bancroft × Sunrise appeared to be affected greatly by environmental factors. Length of secondary kernels in this cross seemed to be inherited in definite Mendelian ratios.

As to the percentage of caryopsis to inner glumes in Bancroft × Sunrise, the results could not be made to fit definite ratios. In Bancroft × Boer oats, black grain color in Boer oats was dominant to the Bancroft red in a 3 : 1 ratio.

The breeding of disease-resistant smooth-awned varieties of barley, W. H. Johnston and O. S. Aamodt (*Canad. Jour. Res., 13 (1935), No. 5, Sect. C, pp. 315–338, figs. 2*).—The barbing of awns, earliness of heading, plant height, and disease reaction were studied in reciprocal crosses between Glabron and Trebi barley, and barbing of awn also was studied in reciprocal crosses between Velvet and Trebi. F_2 segregation confirmed by F_3 studies showed that two factors, explained on the basis of epistasis, controlled barbing of awns. Inheritance of earliness of heading and plant height, both of which were greatly influenced by environment, could best be explained by assuming polymeric factors. Trebi proved highly resistant to stripe disease (*Helminthosporium gramineum*) and Glabron moderately resistant, and the progeny of their cross generally resembled Trebi in this respect. Evidence of transgressive reaction for greater resistance was not shown. A small positive correlation (0.388) was observed between percentage stripe infection and mean height of plant, whereas significant correlations were not disclosed between stripe reaction and either mean number of days from emergence to heading or barbing of awns. A high degree of association (0.737) was found between mean plant height and mean number of days from emergence to heading.

Chromosome studies in Black Mexican maize I. Behavior of extra chromosomes in Black Mexican inbreds and hybrids with dent types of maize, L. M. Humphrey (*Iowa State Col. Jour. Sci., 9 (1935), No. 3, pp. 549–557, pl. 1, figs. 21*).—Studies of the somatic and meiotic chromosomes of 11 inbred lines of Black Mexican sweet corn and eight F_1 crosses with inbred dent types revealed extra chromosomes in all the Black Mexican lines and in seven of the crosses. It was observed that gametes with varying chromosome numbers arise in Black Mexican. Variability of number of chromosomes was found within lines, and numbers exceeding expectation were found in the hybrids.

Some new mutants in maize, E. W. Lindstrom (*Iowa State Col. Jour. Sci., 9 (1935), No. 3, pp. 451–459, pls. 2*).—The four new dominant, monogenic mutations described from Iowa Experiment Station studies include the first, nonlethal, dominant chlorophyll—"old-gold" striping (*Og*)—mutant to be reported.

The second is the recurrence of the teopod mutant (E. S. R., 53, p. 29). A third dominant is a sex gene, sorghum tassel, giving essentially a wholly pistillate form of corn. The fourth is a pericarp color mutation from the recessive P^{wr} (colorless pericarp, red cob) to the dominant P^{rr} (red pericarp, red cob) gene. Of these, only the chlorophyll and the pericarp forms are fertile in the homozygous dominant condition.

The four new recessive mutations described also are all monogenic. A new recessive anthocyanin variation (a_3), similar in appearance to the dominant well-known sun-red, is located on the tenth chromosome. The second recessive is a new lethal albino seedling (w_4) linked with sugary on the fourth chromosome. The third is a new white-streaked (albescent) chlorophyll type (*al*) linked with a *Y* endosperm color gene. The fourth mutant is a recurrence of the sugary gene (*su*) under controlled conditions, which arose in a long-inbred strain of yellow dent corn in one of 18,000 female gametes.

The correlation of cytological and genetical crossing-over in Zea mays: A corroboration, H. B. Creighton and B. McClintock (*Natl. Acad. Sci. Proc., 21 (1935), No. 3, pp. 148–150*).—Additional data supplement those reported earlier (E. S. R., 65, p. 818).

Cytogenetics of hybrids between Zea mays and Euchlaena mexicana, T. J. Arnason (*Genetics, 21 (1936), No. 1, pp. 40–60, figs. 2*).—To test the pairing relations of particular corn chromosomes with corresponding teosinte chromosomes, hybrids were made at the Wisconsin Experiment Station between teosinte (*E. mexicana*) and corn strains homozygous for known reciprocal translocations.

Pairing of chromosomes 1, 2, 6, and 7 of corn and corresponding Florida teosinte chromosomes appeared to be complete in hybrids. Often relatively long segments of either the eighth or ninth corn chromosome failed to form chiasmata with teosinte homologs. Only 5 percent of crossing over occurred in corn-Florida teosinte hybrids in a segment of the ninth corn chromosome which includes 52 map units. Cytological evidence of possible slight structural difference between chromosome 5 of corn and the Florida teosinte chromosome with which it pairs, at least in part, is presented. Crossing over occurred between genes in corn chromosomes 1, 2, 3, and 7 and Florida teosinte chromosomes. The frequency of crossing over in hybrids apparently is not very different from that in pure corn. Conclusive evidence was not yet available as to which corn chromosomes are members of the two heteromorphic pairs found in microsporocytes of corn-Florida teosinte hybrids. Evidence that chromosomes 1, 2, 6, and 7 are not involved has been obtained. Chromosome 5 may be a member of one of the unequal pairs; the other probably is chromosome 8, 9, or 10. Pairing of chromosomes 1, 2, and 6 of corn with Durango teosinte chromosomes appeared to be complete. The cytological evidence suggested that chiasmata very rarely are formed between relatively long segments of both chromosome 8 and 9 of corn with corresponding Durango teosinte chromosomes.

A note on the inheritance of sterility in cotton, J. B. Hutchinson and P. D. Gadkari (*Indian Jour. Agr. Sci., 5 (1935), No. 5, pp. 619–623*).—Sterile plants found in Million Dollar cotton were observed to be recessive to normal with a single factor difference.

A note on the chromosome numbers of some Eleusine species, N. Krishnaswami and G. N. Rangaswami Ayyangar (*Cur. Sci. [India], 4 (1935), No. 2, p. 106*).—Haploid chromosome numbers in metaphase plates and at diakinesis were determined to be for *E. indica*, 9; *E. coracana*, 18; *E. brevifolia*, 18; and *E. aegyptiaca*, 17. Secondary pairing was noted in the last 3 species. *E. indica* appeared to be a diploid, *E. coracana* and *E. brevifolia* tetraploids, and *E. aegyptiaca* probably a tetraploid with one pair lost (4*x*–2).

Basal branching in the earheads of the pearl millet—Pennisetum typhoides, Stapf and Hubbard, G. N. RANGASWAMI AYYANGAR, P. V. HARIHARAN, and S. R. RAMAKRISHNAN (*Cur. Sci.* [*India*], *4* (*1935*), *No. 4, pp. 237, 238, fig. 1*).—The basal branched earhead appearing in pearl millet from Nigeria proved, in studies at Coimbatore, to be a simple recessive to the normal rod-like inflorescence of this millet.

Gametogenesis and embryogeny of Sesamum indicum, L., S. NOHARA (*Jour. Col. Agr., Imp. Univ. Tokyo, 13* (*1934*), *No. 1, pp. 9–25, pls. 4*).—The gametogenesis and embryogeny of *S. indicum* are described and compared with those of *Trapella sinensis*. The genes of characters of the I-type so far investigated are assigned to the chromosomes (N=13) I–XIII, respectively.

Studies on the inheritance of and the relation between kernel texture and protein content in several spring wheat crosses, O. S. AAMODT and J. H. TORRIE (*Canad. Jour. Res., 13* (*1935*), *No. 4, Sect. C, pp. 202–219*).—In crosses of Milturum × Selection I–28–60 wheat, F_2 populations from different F_1 plants behaved in three different ways in regard to inheritance of kernel texture. In two groups vitreous texture was partially dominant and governed by either one or two main factors, while in the third group starchy texture was partially dominant and governed by one main factor pair. Minor modifying factors also influenced the mode of inheritance of this character in these crosses. The heritable nature of kernel texture also was demonstrated, by correlation studies, in crosses of Reward with Selections I–28–46, I–28–60, and I–28–62 (hard red spring wheats originating from Marquillo × Marquis-Kanred). Inheritance of protein content in Milturum × Selection I–28–60 seemed to be controlled by polymeric factors, the exact nature of which was not determined. Lack of correlation for crude protein content between material grown at Brooks and at Fallis, Alberta, indicated that the expression of the mode of inheritance of protein content is influenced readily by environment. In the other crosses studied protein content also was inherited. A strong positive relation existed between vitreous kernel texture and high protein content for the several series of crosses.

Glutathione concentration and hereditary size, III, IV (*Jour. Expt. Zool., 66* (*1933*), *No. 3, pp. 335–349, fig. 1; 71* (*1935*), *No. 2, pp. 311–316*).—This series (E. S. R., 69, p. 787) is continued.

III. *The backcross to the large parent race,* P. W. Gregory and H. Goss.—Data are reported on the mean sulfhydryl concentration of Flemish backcross progeny from a Flemish Giant-Polish cross. The results show that the mean concentration calculated as glutathione in milligrams per 100 g of body weight was 40.1±0.5, as compared with 44.3±0.6 for Flemish Giants, 34.7±0.6 for F_1 Flemish-Polish hybrids, and 29.6±0.7 for Polish progeny. A relatively large coefficient of variation is regarded as evidence supporting a multiple-factor interpretation controlling the inheritance of the concentration. In analyzing the factors responsible for hereditary body size, it is pointed out that three consistently correlated characteristics had been observed—(1) adult racial size, (2) rate of segmentation of the eggs, and (3) the iodine-reducing substances calculated as glutathione in the tungstic acid filtrates prepared from newborn young.

IV. *The effect of nursing upon the concentration,* H. Goss and P. W. Gregory.—A comparison is reported on the mean concentration of glutathione in the whole carcass of newly born rabbits that were nursed to gain an average of 15.9 g during a 50-hr. period, and in others that were fasted so that they lost an average of 7.5 g during the same period. The mean glutathione concentration was 27.7±0.5 mg per 100 g in the fasted group and 56.0±1.5 mg per 100 g in the nursed group.

The inheritance of shank color in chickens, C. W. Knox (*Genetics, 20 (1935), No. 6, pp. 529–544*).—A study is reported of the effects of plumage color on shank color in various crosses of chickens by the U. S. D. A. Bureau of Animal Industry. The results indicate that the gene *W*, for white, or its allel *w*, for yellow color, are presumably present in all breeds, although evidence of their presence in shanks is often masked by the deposition of melanic pigment. The deposition of melanic pigment gives a blue shank in white-skinned birds and green shank with the *W* factor.

The dominant and autosomal nature of the factor *E*, for black plumage, was apparent in the F_1 progeny of the cross of Jersey Black Giants and Rhode Island Reds where both breeds carried yellow skin color.

All the F_1 progeny of a cross of White Leghorn males and Jersey Black Giant females had yellow shanks free from melanic pigment, whereas yellow-shanked males and blue-shanked females were produced by the cross Black Minorca males and White Leghorn females.

These results were accounted for by the effect of the sex-linked barring gene *B* and the inhibiting gene *I*. The White Leghorn male was considered to be of the composition *BBEEII*, whereas the Jersey Black Giant female was of the composition *b-EEii*.

Studies of the effect of the chromogen gene *C* on dark shank color were conducted with Minorcas and Langshans. The black varieties carry *C* and the white varieties carry *c*. The lack of the chromogen gene produces a blue shank as contrasted with black in the varieties with black plumage color. Black-plumage birds carrying yellow may be distinguished from those carrying white by examination of the bottom of the feet.

The genes, with their alleles, considered as influencing shank color, are summarized below:

Genes and their allcles affecting shank color

WW nonlipochrome (white color)	*ww* lipochrome (yellow color)
BB sex-linked barring plumage pattern restricts the black plumage to bars and practically a dominant restrictor of melanic pigment in the shanks	*bb* nonbarred plumage pattern, no restriction of melanic pigment in the shanks
[1] *DD* inhibitor of melanic (dark) shank color. Sex-linked	*dd* sex-linked gene for melanic pigment in the shanks
EE extension of black plumage color, and of melanic pigment in the shanks	*ee* nonextension of black plumage and shank color
CC chromogen for plumage color nonrestrictor of melanic pigment in the shanks	*cc* lacks chromogen and has a diluting effect on the melanic pigment in the shanks
II inhibitor of plumage color, dilutes the melanic pigment in the shanks	*ii* noninhibitor of plumage color and noninhibitor of melanic pigment in the shanks

The author points out that there is still the possibility of a sex-linked dark-shank color gene not yet actually differentiated from the effects of the black and barring genes.

The effects of various combinations of plumage genes on shank color are tabulated.

The induction by X-rays of hereditary changes in mice, G. D. Snell (*Genetics, 20 (1935), No. 6, pp. 545–567, figs. 3*).—Normal male mice from an inbred stock, carrying five recessive genes, were X-rayed and mated to untreated females carrying the dominant alleles for these genes. Approximately 33 percent of the progeny of the X-rayed males produced litters of subnormal size, these resulting from the death in utero of embryos. The evidence presented indicates that the semisterility resulted from chromosome translocations carried in the heterozygous condition. The zygotes thus produced developed abnormally as a result of a lack of balance in the chromosomes which affected the central nervous system. Several morphological abnormalities were observed, part of which were attributable to the X-ray treatment. One of the chromosome translocations was linked with the recessive gene for brown.

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[1] At present not critically differentiated from the barring gene, *BB*.

The genetics of mammary tumor incidence in mice, S. W. MURRAY and C. C. LITTLE (*Genetics, 20 (1935), No. 5, pp. 466–496, figs. 2*).—The results are reported of studies of mammary tumor incidence in virgin females in strains of mice. In a dilute brown strain 50.84 percent developed tumors; whereas, in a black strain no mammary tumors were observed. Mammary tumors occurred in 39.82 percent of the virgin females of the F_1 progeny produced by crossing dilute brown high-tumor females with black nontumor males. In the F_1 progeny produced by the reciprocal cross, only 6.06 percent of the virgin females developed mammary tumors.

Similar differences were observed in the incidence of mammary tumors in the F_2 populations from the two types of crosses, but without regard to the color segregations. For example, F_2s from the cross of dilute brown virgin females of the tumor strain with the black males of the nontumor strain produced 35.54 percent virgin females with mammary tumors, and in the reciprocal cross there were only 5.96 percent with tumors.

In connection with the analyses, the data show the age of occurrence of the tumors in the different strains. It is considered that since the chromosome constitution of the F_1 generation from the two types of crossing are similar (although the tumor incidences differ widely), the incidence of mammary tumors is due to extra chromosomal influences.

No evidence of linkage in the part played by chromosomes in mammary tumor incidence with color factors was indicated, but differences in tumor occurrences were observed through all-aged groups.

The analysis is based on studies of 1,843 F_1 and F_2 progeny.

The establishment of the C_3H inbred strain of mice for the study of spontaneous carcinoma of the mammary gland, L. C. STRONG (*Genetics, 20 (1935), No. 6, pp. 586–591, figs. 2*).—An account is given of the descendants of a single male propagated through inbreeding over a period of 15 yrs., in which spontaneous carcinoma of the mammary gland developed in all of the female descendants in 21 generations. This is to be considered as a pure line as regards the spontaneous development of this specific type of carcinoma.

FIELD CROPS

Studies in the technique of field experiments, I–III, J. B. HUTCHINSON and V. G. PANSE (*Indian Jour. Agr. Sci., 5 (1935), Nos. 4, pp. 523–538, fig. 1; 5, pp. 545–553, fig. 1; 554–558*).—This group includes three contributions.

I. *Size, shape, and arrangement of plots in cotton trials.*—In a uniformity trial with Malvi cotton at the Indore Institute of Plant Industry, standard error percentage per plat decreased steadily as plat size increased, and for any given plat size it decreased steadily as the length of the plat (along the rows) was increased. The advantage of long, narrow plats laid out along the rows compared with plats of the same size and shape was shown to be independent of the fertility gradient, and suggestions were that it is associated with the planting method. Approximately square blocks appeared to eliminate more of the soil heterogeneity than rectangular blocks. With blocks 1/25-acre or larger, shape appeared to be the most important factor in determining efficiency. A Latin square lay-out had no advantage over an efficiently designed randomized block lay-out with the same number of plats.

II. *Sampling for staple-length determination in cotton trials.*—Information was collected on halo-lengths, plat by plat, in replicated variety trials with Indian cottons and also on halo-lengths of single plants. With skilled observers, five measurements per plat or per plant were adequate for a 0.5 mm standard error of the mean. Individuals varied greatly in efficiency as measured by the standard error of the means of their observations. In replicated plat trials measured by skilled observers, intra-plat variation was responsible for but a small proportion of the error variance. Sampling for staple length measurement, therefore, should be platwise and not from the pooled product of all plats. A note on the standard error of estimates of gin percentage in variety trials is appended.

III. *An application of the method of covariance to selection for disease resistance in cotton.*—In an experiment on the resistance of cotton strains to root rot in which alternate rows of all plats were planted with a uniform control strain, the error variance in general was reduced about one-half by adjustment for the covariance of control and variety rows, giving the same advantage obtainable by doubling the number of plats.

Some soil-heterogeneity trials at Pusa and the size and shape of experimental plots, R. D. Bose (*Indian Jour. Agr. Sci., 5 (1935), No. 5, pp. 579–608, figs. 4*).—Soil-heterogeneity experiments conducted for three consecutive years in the same field with Pusa barley, wheat, and lentils are reported. The coefficient of correlation between contiguous plats was used as an index of soil heterogeneity according to the Harris method (E. S. R., 33, p. 727; 43, p. 526), and 1×5 and 2×5 combination plats were made up for this purpose. The correlation coefficients for these combinations did not differ significantly, yet the presence of significant coefficients for each combination denoted definitely that the field was not absolutely uniform.

Use of the Fisher analysis of variance to determine the drift in the fertility of the field with the same data revealed considerable variation in the yields for columns and much less in the rows, indicating a fertility gradient in the field which ran from west to east, and this was seen further when contour maps of soil fertility were drawn from results of plat yields. Conclusions were that the Harris method provides a measure of heterogeneity present in the whole field, whereas the Fisher analysis of variance measures soil heterogeneity and also indicates the direction of the fertility gradient and should, therefore, be a more comprehensive method for such work. Results of the uniformity trial with Pusa 52 wheat were utilized to show what size and shape in this field will produce the least variation within plats on the assumption of five hypothetical treatments, and the analysis of variance method was used to interpret the results.

Bibliography of field experiments, H. M. Steece, F. R. Immer, T. A. Kiesselbach, and J. T. McClure (*Jour. Amer. Soc. Agron., 27 (1935), No. 12, pp. 1013–1018*).—This bibliography includes 134 titles of the more important contributions on the methodology and interpretation of results of field plat experiments either reported since or not included in the revised bibliography (E. S. R., 70, p. 761).

The physical environment of Scottish agriculture in relation to crop improvement problems, C. P. Snodgrass (*Ann. Appl. Biol., 22 (1935), No. 3, pp. 443–464, figs. 16*).—Coordination of available data relating to environmental conditions of agricultural regions is advocated as a means of facilitating the testing and distribution of new crop varieties. The physical environment of three agricultural regions is described, and its influence on the length of the growing season, the length of crop rotation, and distribution of the principal crops (E. S. R., 68, p. 468) are discussed.

Green pastures for the plant breeder, H. K. Hayes (*Jour. Amer. Soc. Agron., 27* (*1935*), *No. 12, pp. 957–962*).—Some of the accomplishments in plant breeding, especially in breeding spring wheat resistant to stem rust, breeding improved hybrids with corn, and improvement of grasses, are pointed out with an analysis of the main reasons for success attained and discussion of future possibilities.

Summer crops for green manure and soil improvement, R. McKee (*U. S. Dept. Agr., Farmers' Bul. 1750* (*1935*), *pp. II+17, figs. 5*).—General and specific information is given for the growing of alfalfa, buckwheat, common sesbania, cowpeas, crotalaria, Florida beggarweed, lespedeza, red clover, soybeans, Sudan grass, sweetclover, and Deering velvetbeans as summer crops for green manure, with directions on turning under the crops and remarks on different types of green manure.

[Field crops research in Illinois], F. C. Bauer, E. E. De Turk, F. H. Crane, J. J. Pieper, W. L. Burlison, C. A. Van Doren, J. C. Hackleman, C. M. Woodworth, O. H. Sears, L. E. Allison, W. P. Flint, W. J. Mumm, G. H. Dungan, D. C. Wimer, and O. T. Bonnett (*Illinois Sta. Rpt. 1934, pp. 26, 27, 30–32, 41–53, 54, 55, 57–64, 65–70, figs. 6*).—The progress reports of investigations with field crops, embraced in these pages (E. S. R., 70, p 609), are concerned with variety trials with corn, winter and spring wheat, oats, barley, buckwheat, grain sorghum, alfalfa, red clover (strains), lespedeza, soybeans, pasture grasses, legumes and mixtures, seed flax, safflower, potatoes, and Jerusalem-artichokes; baking and doughball tests with winter wheat strains; breeding work with corn for oil and protein content, wheat, oats, barley, and soybeans; improvement of corn by top-crossing and by reconstitution; the inheritance of "floury" endosperm in corn, kernel texture in wheat, and seed characters in soybeans; cultural (including planting) tests with Sudan grass, red clover, and other clovers; nurse crop and cutting tests with red clover; response of lespedeza to limestone; effects of storage on home-grown and northern-grown seed potatoes; analyses of yields of varieties of winter wheat; fertility value of cornstalk ash and residues and of straw, and growing soybeans, all for soil improvement; effect of crop rotations, crop residues, and legumes on soil productivity; use of cowpea cultures for lespedeza; a comparison of types of inoculants; tests of chlorates and other chemicals for poison ivy and quackgrass; life history and control studies with wild garlic and onions; and production studies with crops relatively new to Illinois, including pyrethrum, safflower, Russian hemp, flax, buckwheat, and Jerusalem-artichoke.

[Field crops research in Wisconsin, 1933–34] (*Wisconsin Sta. Bul. 430* (*1935*), *pp. 33, 34, 37–50, figs. 6*).—Progress is reported again (E. S. R., 72, p. 466) on the investigation of the causes of tobacco fermentation (E. S. R., 72, p. 43), by J. Johnson; the development of Sturgeon wheat with variety tests at the Peninsular Substation, and time of planting tests with oats, barley, and spring wheat at the Ashland and Peninsular Substations and with canning peas at the Marshfield Substation, all by E. J. Delwiche; the development of improved rye by inbreeding and hybridization, by B. D. Leith and H. L. Shands; production and comparative tests of selected hybrid strains of corn, by N. P. Neal, Leith, A. H. Wright, R. A. Brink, and J. G. Dickson; variety, cultural, and utilization tests with lespedeza, by E. D. Holden; grazing experiments with dairy cattle on fertilized and rotationally grazed pastures, by E. Truog, G. B. Mortimer, D. S. Fink, and F. T. Boyd; and trials of emergency forage crops at Hancock Substation, including grain sorghums, sorgos, millets, soybeans, and

Sudan grass, by A. R. Albert. Certain activities were in cooperation with the U. S. Department of Agriculture.

The grasslands of the South Island of New Zealand: An ecological survey, F. W. Hilgendorf (*New Zeal. Dept. Sci. and Indus. Res. Bul. 47 (1935), pp. 24, pl. 1, fig. 1*).—The South Island of New Zealand is described and mapped from an agricultural and pastoral viewpoint, with individual descriptions of 21 plant associations and 6 land districts and remarks on current tendencies in grassland modification.

Alfalfa-seed investigations in Utah, J. W. Carlson (*Utah Sta. Bul. 258 (1935), pp. 48, figs. 8*).—Research concerned with the influence of meteorological and other environmental factors, blooming and pollination, cultural practices, and varietal differences on seed setting in alfalfa, carried on at Uintah Basin Alfalfa-Seed Experimental Farm from July 1, 1925, to December 31, 1934, is summarized. The progress of these studies already has been noted in some detail (E. S. R., 67, p. 237).

The dry and desert-like climate of Utah and especially the light but frequent summer precipitation in its important alfalfa-seed districts, are deemed significant factors in alfalfa-seed production. The low precipitation is believed to condition the atmosphere rather than the soil for alfalfa-seed growing, which usually needs irrigation or underground water for success. In the important seed districts of Utah, the average annual precipitation ranges from 5 to 15 in., of which about 3 in. falls during the seed-growing season. Cloudy days and summer showers in the seed districts are from 14 to 30 percent more frequent than in the areas of greater annual precipitation in Utah and in other sections where this enterprise is of minor importance. A relatively low mean moisture content of the air, with a high degree of variability or frequent fluctuations, appears to be associated with good seed-setting.

From 6 to 8 successive crops of alfalfa flowers are produced in a normal season in the Uintah Basin. Seed-setting usually has been highest with the first three and the last crops of flowers and noticeably poorest during midseason, or from about July 15 to August 15 each year. As alfalfa flowers grow older from the time they expand from the buds, their capacity to form seedpods decreases. Common stripping in alfalfa seems to result from unfavorable weather conditions which may prevent proper pollination and fertilization of flowers. Bud-blasting in part results from injury by Lygus bugs and, apparently, is an important cause of poor seed-setting in rank growth and thick stands of alfalfa.

Seedpods were formed by 27 percent of alfalfa flowers allowed to develop naturally, tripped artificially 44, and artificially cross-pollinated 54 percent. When flowers were artificially tripped or cross-pollinated and then bagged for protection against Lygus bugs, seed-setting in midseason and on flowers of second-crop alfalfa equaled that on similarly treated early-season flowers of the first crop. These flowers when left exposed to open-field conditions made a lower percentage of pods. Artificially tripped flowers on the average gave the fewest seeds per mature pod and cross-pollinated flowers the most, although differences were slight.

The inbreeding or forced self-pollination of alfalfa flowers resulted in reduced seed yields in plants grown from the seed produced. The reduction in seed yield due to selfing equaled about 50 percent of the yields of progeny from open-pollinated seed of the same plant. Plants grown from seed from open-pollination on plants, whose seed production capacity was reduced by selfing in a previous generation, showed partial recovery in seed yield, probably due to hybrid vigor resulting from cross-pollination in the field. This supposed hybrid vigor was manifested by an improved tendency of flowers to form seedpods, by a greater proportion of the seedpods to mature without stripping, and by more seeds in mature pods.

Hill-spaced, row-spaced, and light-seeded drilled stands of alfalfa, on the average, have given the highest acre-yields of seed, although for seed production in especially favorable years thick stands may equal thin stands. Because thick stands of alfalfa produce more succulent growth and more protection for nymphs of Lygus bugs, they evidently are injured more often for seed production because of insect activity. Hill-spaced alfalfa, which gave the highest and most consistent seed production over 7 yr., finds greater usefulness in nursery and breeding work than in commercial seed-growing.

Alfalfa varieties, and especially with strains within varieties, have differed greatly in seed production and in response to insect injury. The principal source of variation in forage yields from alfalfa varieties and strains is attributed to seasons. Varieties high in forage production at one station or for one year or crop usually are also high at other stations in the same year and for the same crops. Exceptions do occur, however, so that certain varieties may be found to be better adapted for special conditions. Among varieties with highest average forage production were Cossack, Dakota common, Dakota 12, Turkistan, Hardistan, and Grimm.

General preliminary studies on the physiology of delayed germination in Avena fatua, L. P. V. Johnson (*Canad. Jour. Res., 13 (1935), No. 5, Sect. C, pp. 283–300*).—A series of studies at the Washington Experiment Station revealed great variations in the after-ripening periods of a number of selections of *A. fatua*, the common wild oats. Indications were that delayed germination is determined by a condition of the seed coat which develops after fertilization. Tests of entire panicles suggested a correlation between germinability and the position of the seed in the panicle. The after-ripening period of secondary grains was much longer than that of primary grains. Placing of incompletely after-ripened kernels under germinative conditions induced secondary dormancy. Exposure to light appeared to stimulate germination slightly in seeds which were in the early stages of after-ripening, but seemed to have a harmful effect upon seeds more or less completely after-ripened. The after-ripening process was retarded by low dry-storage temperatures. Increased germination resulted from storage in a frozen condition at freezing temperatures. Dormancy was overcome more or less completely by breaking the seed coat over the embryo or by soaking seeds in potassium nitrate solutions. Exposure of seeds under germinative conditions to an atmosphere having an increased oxygen concentration stimulated germination definitely. Pure oxygen, ether, and sodium thiocyanate had more or less indifferent effects upon germination, whereas ethylene chlorhydrin and dichlorethylene were definitely injurious.

"It is inferred from the combined results that delayed germination is due to post-fertilization changes, related either to tissue absorption or development, which occur in the seed coats of *A. fatua* but not in readily germinable species, and which result in a restriction of the oxygen supply to the embryo. It is believed that the after-ripening process may consist, essentially, of a series of changes in the tissues of the seed coat which result in an increased permeability to oxygen."

Barley and malt studies.—I, Developing new varieties of barley for malting and their properties, J. G. Dickson, H. L. Shands, A. D. Dickson, and B. A. Burkhart (*Cereal Chem., 12 (1935), No. 6, pp. 596–609, figs. 8*).—This contribution from the Wisconsin Experiment Station in cooperation with the U. S. Department of Agriculture largely discusses methods of procedure in a coordinated program for barley improvement, the topics covering barley production in the United States and its expansion; available varieties; malting quality and the need for research; malting equipment and procedure used in preliminary studies of malting quality; comparative varietal studies; and development of new malting varieties.

Comparisons of 5 varieties grown in 8 States in the malting barley area and of samples of 3 varieties grown by farmers in important Wisconsin barley areas showed Oderbrucker to yield a somewhat better quality of malts over the entire range of growing conditions than any other variety. Wisconsin Pedigree 38 was slightly lower in extract, low in water-soluble nitrogen in the wort and diastatic power, and slightly higher in malt recovery. Trebi, in general, was higher in extract and malt recovery but was very low in water-soluble nitrogen in the wort and low in diastatic power. Differences in varietal, response to treatment were observed. In rate of water absorption each variety maintained its relative varietal position regardless of the influence of the region in which the barley was grown. The varieties with the highest malting quality were reported to be deficient in yield and disease resistance, while the more productive barleys were less suitable in malting quality.

The production of barley seed through post-harvest pollination, M. N. Pope (*Jour. Heredity, 26* (*1935*), *No. 10, pp. 411–413, figs. 2*).—Spikes of Hannchen (2-rowed) barley, emasculated and dusted with pollen from spikes of 6-rowed types after the culms were harvested before flowering and placed in distilled water, produced viable seed which gave rise to plants bearing spikes showing hybrid character.

The economic advantages of improved varieties of cotton, J. H. Moore and R. T. Stutts (*Cotton, 99* (*1935*), *No. 12, pp. 41–43, 108, fig. 1*).—Features of this contribution from the North Carolina Experiment Station, cooperating with the U. S. Department of Agriculture, have been noted (E. S. R., 71, p. 315) from another source.

Cotton: From the raw material to the finished product, R. J. Peake, revised by H. P. Curtis (*London: Isaac Pitman & Sons, 1934, 4. ed., rev., pp. XII+216,* [*pl. 1*], *figs.* [*73*]).—This is a revision and enlargement of the book already noted (E. S. R., 26, p. 437).

The climatic influences upon the pollen development of the Italian hemp, G. B. Medwedewa (*Ztschr. Induktive Abstam. u. Vererbungslehre, 70* (*1935*), *No. 2, pp. 170–176, figs. 9*).—Italian hemp, *Cannabis sativa*, grown in Caucasia usually showed a normal course of microsporogenesis, whereas the same hemp grown in the Moskva (Moscow) district was characterized by many irregularities, including chiefly the fusion of the nuclei in the archesporial tissue, in prophases and in the first and second telophases; failure of conjugation of chromosomes; and the formation of the restitution-nuclei in the first and second divisions. Young pollen grains of the hemp from Caucasia had regular round forms and varied little in size, whereas those from Moskva included many deformed, gigantic, dwarfish, and polynuclear grains. The differences are attributed to climatic rather than to other influences.

Problems in the breeding of millet (Setaria italica (L.) Beauv.), H. W. Li, C. J. Meng, and T. N. Liu (*Jour. Amer. Soc. Agron., 27* (*1935*), *No. 12, pp. 963–970, figs. 5*).—In the course of millet breeding work at Honan University, Kaifeng, China, two maximum periods of blooming were observed, one between 4 and 7 a. m. and another between 9 and 12 p. m. In a year with cooler temperatures, the first maximum was 3 times as high as the second, while when the temperature was higher the periods were similar in intensity. Practically no blooming occurred between noon and 6 p. m. The blooming rate was correlated negatively with temperature and positively with humidity. Natural crossing amounted to 5.6 percent in 1933 and 7.63 in 1934. *S. italica* and *S. viridis* were found to have 18 somatic chromosomes and 9 haploid.

A preliminary note on the classification of cultivated Indian mustards, T. S. Sabnis and M. G. Phatak (*Indian Jour. Agr. Sci., 5 (1935), No. 5, pp. 559–578*).—A general plan of the classification of cultivated Indian mustards belonging to *Brassica nigra*, *B. rugosa*, *B. juncea*, *B. campestris*, and *B. napus* is presented, with a determinative key to and description of the species and their varieties and the several types of *B. juncea* and *B. campestris*. Observations on flowering and pollination are recorded.

Registration of varieties and strains of oats, VII, T. R. Stanton (*Jour. Amer. Soc. Agron., 27 (1935), No. 12, pp. 1001, 1002*).—Support oats, approved for registration (E. S. R., 72, p. 764), is of uncertain parentage but was developed at the Oregon Experiment Station in cooperation with the U. S. Department of Agriculture. It is a midtall to tall, midseason, gray-seeded winter common oats similar to Winter Turf and characterized by high yield, stiff straw, thin hull, heavy stooling, and rust-evasion in western Oregon. At Corvallis, Oreg., Support has been about 10 days earlier than Winter Turf and an excellent support crop for annual viny legumes such as vetch.

The improvement of winter oats, H. Hunter (*Jour. Agr. Sci. [England], 25 (1935), No. 3, pp. 419–444*).—Breeding work aimed at production of an oats variety combining the winter resistance and grain quality of Grey Winter and straw of better standing power produced two selections with characters approaching those desired. These oats, termed 109/1 and 109/3, were obtained from the progeny of Argentine×Grey Winter. Another selection of similar parentage, 136/17, was characterized by superior standing straw. Resistance to low temperatures and a relative degree of earliness in ripening did not appear to be incompatible. The most promising hybrids surpassed the Grey Winter parent in grain yield.

The relation of soil treatment to the nodulation of peanuts, H. B. Mann (*Soil Sci., 40 (1935), No. 6, pp. 423–437, pls. 3*).—When calcium carbonate was applied at the rate of one ton per acre to virgin Norfolk sandy loam (pH 5.3) and to virgin Coxville fine sandy loam (pH 4.5) in North Carolina Experiment Station studies, the nodulation of Virginia Bunch peanuts was increased throughout the growing season. Similar treatments on a cultivated Norfolk sandy loam previously limed to pH 6.6 did not increase nodulation, and on this soil during the latter part of the growing season a slight reduction of peanut nodulation followed the use of calcium carbonate. Broadcasting calcium sulfate at the rate of one ton per acre both delayed and reduced nodulation in all three soils. Probably because of the high acidity produced, sulfur applied at the rate of 400 lb. per acre to these soils prevented nodulation at all growth stages. Combined applications of sulfur and calcium carbonate or calcium sulfate and calcium carbonate had little effect upon nodulation except that at maturity the latter combination usually increased nodulation. The growth of peanut plants, as measured by dry weight, could not be correlated directly with nodulation.

Calcium carbonate decreased, calcium sulfate slightly increased, and sulfur greatly increased acidity of all the soils used. Probably due to its greater buffer capacity, the Coxville soil resisted reaction changes more than either of the Norfolk soils.

Varying applications of calcium carbonate to virgin Norfolk and Coxville soils affected peanut nodulation quite differently. Many more nodules were produced on the Coxville than on the Norfolk soil, but response to liming was similar on both. Moderate quantities of calcium carbonate stimulated and increased nodulation, whereas heavy applications retarded and reduced it.

Rice culture in the Tonkin delta, R. Dumont (*La Culture du riz dans le delta du Tonkin. Paris: Soc. Éd. Géogr., Marit. e Colon., 1935, pp. 435, [pl. 1], figs. 39*).—This book in successive chapters deals with the environment and general factors concerned with the rice industry in Tonkin, the economic status of rice production, varieties, irrigations, rotation crops, preparation of soil, fertilizers and green manure, transplanting, harvesting, threshing, drying, and storage, and the commercial movement of the crop. Remarks on plant diseases and insects and other parasites are appended.

Some observations on the essential oil content of Rosha grass (Cymbopogon martini var. Motia), G. Lall (*Indian Jour. Agr. Sci., 5 (1935), No. 3, pp. 415–427, fig. 3*).—Seasonal variations in the oil content of rosha grass (*C. martini* v. *motia*) and its leaves, flowers, and stalks were studied from August 1932 to March 1933. The leaves yielded the most oil throughout the season. Flowers were short-lived and gave the maximum amount of oil, 1.37 percent on dry weight, during the fourth week of November (a week after appearance). The stems contained only a negligible amount of oil, 0.03 percent.

The whole plant yielded the maximum amount of oil about a week after flowering. From late October to late November was found to be the maturity period and best suited for harvesting and oil distillation. Intermittent frosts turned the plant brown and lowered the oil content of leaves, flowers, and the entire plant to the extent of 13, 59, and 32 percent, respectively, the flowerheads being most susceptible to frost. Stacking before frost did not arrest the decline in the oil content, indicating that the crop, for distillation, should be harvested before frost. The leaves were found to yield the best quality oil, the flower-heads and the stems oil of slightly inferior quality, and the stacked grass the poorest quality.

Injurious after-effects of sorghum growing, V. Ramanatha Ayyar, S. Kasinath, and M. R. Balakrishnan (*Cur. Sci. [India], 4 (1935), No. 2, p. 99*).—Experiences of the authors suggest that increase in the sodium-ion in the soil after cropping with sorghum may be a cause of injurious after-effects of the sorghum rather than soil exhaustion or toxicity from decomposition of residues.

Sugar cane breeding in Egypt.—A progress report, A. H. Rosenfeld (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 161 (1935), pp. [1]+21, pls. 3*).—A brief résumé of sugar cane breeding work in Egypt presented includes descriptions of Mauritius, Puerto Rico, Hawaiian, and other seedlings tested; a key to the species of *Saccharum;* and a list of the principal varieties used in breeding work, with indicated parentage.

Morphological variations in wheats, E. Miège (*[Internatl. Rev. Agr.], Mo. Bul. Agr. Sci. and Pract. [Roma], 26 (1935), No. 9, pp. 409–418*).—Observations during 12 yr. showed that wheat organs considered stable have varied appreciably in Morocco according to time and locality, especially the awns, dentition of the glumes, and color and thickness of the straw. Such modifications are more or less marked according to variety. Variations in time in a given locality did not follow any particular rule but were determined by local humidity conditions. The locality variations observed also seemed to be determined by humidity conditions which could be modified measurably by the soil and irrigation. In a locality with poor soil and dry climate, the general plant height and thickness of the straw wall decreases, the black pigmentation and villosity, and the compactness of the spikes are accentuated, the awns and teeth become longer, the awns become straggling, the spikes are modified, and the glumes open more easily, which favors cross-pollination. The variations often are extensive enough to change the characteristics of a variety. Such characters as precocity and resistance to rust also may be affected. However, these variations did not appear to be hereditary and plants recovered their original characteristics when grown again in their original home. The secondary characters (E. S. R., 67, p. 240) evidently were preserved integrally in the variety wherever cultivated.

Two opposite phenomena were also observed according to varieties. When a pure line was introduced a general and more or less prolonged diminution occurred in vigor, height, and yields, correlated with certain morphological modifications, up to the time of stabilization. On the other hand, there was an increase in vigor, size, etc., exhibited by a type of general improvement and heterosis which persisted for several years or decreased progressively until the stabilization of the type which remained superior to or equaled the original variety.

Carotenoid pigments in wheat with special reference to varieties and strains, W. W. WORZELLA and G. H. CUTLER (*Cereal Chem., 12 (1935), No. 6, pp. 708–713*).—The amount of carotenoid pigments was studied on finely ground whole-wheat meal of 29 wheat varieties and 72 hybrid strains grown under uniform environmental conditions at the Indiana Experiment Station during 1932–33 and 1933–34. Granulation or fineness of wheat meal influenced the extraction of the pigments, which increased with the fineness of the meal. The significant, positive, inter-annual, correlation coefficients for carotenoid pigments obtained between results of different seasons when wheats of diverse nature were grown under similar environmental conditions, indicated that carotenoid pigmentation is an inherited varietal character. Hybrid families which appear to be homozygous and others heterozygous for this character are noted. The range of the wheats studied in carotenoid pigmentation, expressed as carotene in parts per million, varied from 1.66 to 3.8 for 1932–33 to 1.8 to 3.8 for 1933–34.

Aerial fertilization of wheat plants with carbon-dioxide gas, E. S. JOHNSTON (*Smithsn. Misc. Collect., 94 (1935), No. 15, pp. (2)+9, pls. 6*).—Marquis wheat was grown to maturity in enclosed pots and in small enclosed plats, and commercial carbon dioxide was mixed with the air surrounding the plants. The air enriched with carbon dioxide evidently increased tillering, greatly increased the weight of straw, increased number and weight of heads and number of kernels produced, and slightly delayed the time of heading. The weight per kernel was practically the same as that of the controls even where phosphorus and potassium fertilizers were supplied at the time of heading. In the plat experiments the enclosed plants were larger, heavier, and more succulent, and the weight per grain was somewhat greater than the plants grown in the open.

Effect of frost on wheat at progressive stages of maturity, II, III (*Canad. Jour. Res., 13 (1935), Nos. 1, Sect. C, pp. 1–31, figs. 5; 5, Sect. C, pp. 263–282, figs. 6*).—The series (E. S. R., 71, p. 474) is continued.

II. *Composition and biochemical properties of grain and flour,* A. G. McCalla and R. Newton.—Increase in dry weight of wheat kernels after flowering accelerated slightly for 14 days, was steady for 10 days, and then gradually fell off to zero in about 14 days more, at which time the kernels weighed 32 g per thousand and contained 58 to 60 percent dry matter, a critical point marking the practical cessation of chemical changes. Weight of nitrogen rose steadily to about 1 g per 1,000 kernels at the critical stage. Respiration losses of carbon before and after harvest appeared to account largely for changes in the percentage nitrogen in the kernels. The ratio of nitrogenous to nonnitrogenous material moved into the endosperm seemed to have been rather constant throughout the main developmental period. Ammonia nitrogen first rose to a maximum of 4.8 mg per 1,000 kernels and then decreased to negligible proportions at the critical stage. Salt-soluble nitrogen in fresh kernels dropped from an initial value of 75 percent of the total nitrogen to 22 percent at the critical stage, when slightly more than one-third was nonprotein. Drying kernels before analysis changed the percentage composition, owing to respiration and synthesis, by an amount varying with rate and conditions of drying.

Frost did not affect the ash content of kernels. Four degrees of frost (28° F.) did not affect the percentage total, salt-soluble, or nonprotein nitrogen, but 8°, 10°, and 14° F. frost in cuttings before the critical stage reduced the percentage total nitrogen in both grain and flour milled from it, an effect attributed to slowing up of respiration, and increased the percentage of the fractions, ascribed to checking of synthesis. The yields of washed gluten from control samples were about the same at all stages, but physical properties did not attain maximum quality before the critical stage. Four degrees of frost did not affect yield but reduced quality in cuttings before the critical stage. Heavier frost reduced both yield and quality in immature samples, the effect of the heaviest frost on quality persisting to full maturity. Reducing and invert sugar percentages declined in early stages of development. The frost did not affect the content of invert sugar, although 8°, 10°, and 14° F. increased reducing sugars in flours from grain cut before the critical stage, partly due to increased enzyme activity, as indicated by greater maltose production, and partly to slowing of respiration by frost injury. Kernel weight gained by translocation after cutting immature check samples but not in heavily frozen samples. Respiration losses in the shock were estimated to be about twice as great from the checks as from the heavily frozen samples.

III. *Milling and baking quality*, R. Newton and A. G. McCalla.—Flour yields from unfrozen wheat samples cut at progressive stages of maturity increased until the dry matter of the grain at time of cutting reached 58 percent, and remained constant thereafter. Exposure to frost reduced the flour yield at all stages of maturity, the reduction being about proportional to the immaturity of the sample and the severity of exposure. Flour yield from mature frozen samples was slightly yet definitely lower than from comparable unfrozen checks. In baking quality the flour of the unfrozen checks was relatively high even when the wheat was cut while immature. Frost exposure reduced the quality of immature samples in proportion to their immaturity and severity of exposure but had practically no effect on mature samples. The flour from immature frozen samples deteriorated faster in storage than that from unfrozen checks. Reduction in flour yield was in proportion to reduction in grade, but the reduction in baking quality averaged less than anticipated from grading results. These studies confirmed the earlier conclusion that 58 percent dry matter represents a critical stage in wheat development, and that all samples harvested after this stage may be considered as mature.

Soft winter wheat studies.—IV, Some factors producing variations in wholemeal "time" data, E. G. Bayfield (*Cereal Chem., 12 (1935), No. 6, pp. 559–568*).—Research reported in the fourth of this series (E. S. R., 73, p. 472) showed that the Pelshenke and Cutler-Worzella procedures give definitely different results. With the 150-cc beaker used as standard equipment at the Ohio Experiment Station, the author believes a 4-g doughball will have definite advantages over larger doughs provided the entire range in world wheat strength is to be encountered. He thinks that the time test is empirical in nature and that relative results are the best to be hoped for.

Of the factors studied, variation in vessel diameter proved to be fairly important as a cause of variability in results. The doughball should be of such a size that it receives no support from the vessel used in carrying out the test. If the vessel is of proper size the time increases with the decreasing size of the doughball and increasing moisture in the meal (within the limits studied). Uniformity in grinding is essential, since variations in granulation influence the test. Samples heated to eliminate insects appeared to give time data which are erratic and higher than from the same samples not so heated. Increases in time due to aging of the meal were found to be within the experimental error of the determination provided tests were made within a few days after grinding.

Weeds of New York, W. C. Muenscher (*[New York] Cornell Sta. Bul. 635 (1935), pp. 16, figs. 2*).—The 406 kinds of weeds which grow in New York are listed together with their scientific and common names, duration of life, and remarks on their distribution and prevalence in the State, and whether native or introduced. Of the weeds listed, 121 are native, 277 introduced, and 8 intra-State introductions; and 120 are annuals, 38 annual or winter annual, 22 annual or biennial, 28 biennial, 8 biennial or perennial, and 190 perennial.

Weed seeds, E. Korsmo (*Ugressfrø (Unkrautsamen). Oslo: Gyldendal Norsk Forlag, 1935, pp. 175, pls. 34*).—Seeds and fruit-bearing organs of 306 weed species are described in English, German, and Norwegian and are illustrated in color, with remarks on world distribution and infested crops. The seeds of the flowering and fruiting species which were described in a previous publication (E. S. R., 63, p. 443) and 100 additional species are dealt with. An index arranged alphabetically according to scientific names of all the species described, with the common names in 11 different languages, is appended.

Statistical analyses applied to research in weed eradication, F. F. Lynes (*Jour. Amer. Soc. Agron., 27 (1935), No. 12, pp. 980–987*).—Data obtained from the application of a number of herbicides to bindweed on 1-sq.-rod plats arranged in randomized-block method and 5-replicated were interpreted by the analysis of variance method. The analyses indicated that chemicals now in use give a significant kill, and that there is no significant difference between the chlorates and Crafts' acid arsenical spray. Beet molasses was not effective in the concentrations (¼ to 1 bbl.) used in this experiment. Since the arsenical spray is cheaper and has no residual effect on the soil, making it possible to grow a crop on the land each year to help defray cost of treatment, it seemed more economical for use in Otero County, Colo., in eradication of bindweed than the chlorates. It also was observed that the use of stand counts offers an accurate means of comparing the percentage kill.

The use of a wetter in weed spraying, F. L. Engledow and R. M. Woodman (*Jour. Min. Agr. [Gt. Brit.], 42 (1935), No. 7, pp. 663–666*).—A spray made up in the proportion of ammonium sulfate 2 lb., soft soap for spreader 1 lb., and water 2 gal., was very effective in the control of knotgrass (*Polygonum aviculare*) and *Trifolium striatum* in lawns, whereas plain ammonium sulfate solution was rather ineffective.

HORTICULTURE

Garden science, J. Grainger (*London: Univ. London Press, [1935], pp. 265, figs. 110*).—A scientific background of plant development and garden practice is discussed in nontechnical language.

Some fundamentals of nutrition of horticultural crop plants, H. Hill (*Sci. Agr., 16 (1935), No. 1, pp. 21–27; Fr. abs., pp. 26, 27*).—In discussing methods employed by the Central Experimental Farm, Ottawa, in nutritional studies with various plants, the author describes the foliage characteristics resulting from deficiencies of nitrogen, potash, phosphorus, calcium, and magnesium and something of the associated changes in chemical composition.

[Horticultural studies by the Illinois Station] (*Illinois Sta. Rpt. 1934, pp. 207–213, 215–218, 219–223, 224, 225, 227–229, 230–247, figs. 2*).—Among studies, the progress of which is noted, are the breeding of apples and peaches, by J. C. Blair and J. S. Whitmire; physiological characteristics of fruit plants that may be associated with resistance to cold, by V. W. Kelley; the training of apple trees, by W. A. Ruth and Kelley; development of a balanced orchard management program for apples, by M. J. Dorsey and R. S. Marsh; relation of weather to fruiting of apples, and the effects of pruning and no pruning and of nitrogen fertilizers on bearing apple trees in sod, both by Ruth; effect of different pruning treatments upon the fruiting of apples, by Kelley; development of effective spray programs for the control of apple scab, by H. W. Anderson; oil sprays and oil spray injury of the apple, by Kelley and M. D. Farrar; the removal of spray residues from apples, by Ruth and K. J. Kadow; leguminous cover crops for orchards, by Dorsey and Ruth; relation of fertilizers to tree growth in the peach, and the relation of size of crop as regulated by pruning and fruit thinning to quality in the peach, both by Dorsey and R. L. McMunn; relation of time of maturity of bark and wood to winter injury in peaches, apples, and other species, by Dorsey and Anderson; pruning of the sour cherry, and a comparison of bud hardiness in old and new varieties of peaches, both by McMunn; rootstocks for cherries, by Dorsey and McMunn; the relation of weather to yield and growth of small fruits, testing of varieties of brambles, gooseberries, Japanese quinces, persimmons, and black walnuts, pruning of grapes, breeding of gooseberries, and the testing and breeding of raspberries, all by A. S. Colby; fertilizers for truck crops, methods of applying fertilizers, time of cutting asparagus, methods of fertilizing asparagus, and strains of vegetables, all by J. W. Lloyd and E. P. Lewis; the improvement of sweet corn by recombination of pure lines, methods of planting sweet corn, and the development of new varieties of tomatoes for greenhouse and field culture, all by W. A. Huelsen; the fertilizing of greenhouse tomatoes, by Lloyd; the improvement of lima beans, by Huelsen; varieties of gladiolus, and the use of old and new soil in the greenhouse, both by F. F. Weinard; peony varieties, by H. B. Dorner and Weinard; and methods of cutting peonies, plant selection as a means of preventing flower splitting in the carnation, and varieties of roses for forcing, all by Weinard.

New varieties of vegetables show promise (*Wisconsin Sta. Bul. 430 (1935), pp. 35, 36*).—Brief comments are presented on the results of observations by J. G. Moore and O. B. Combs on the Stringless Red Valentine, Stringless Black Valentine, and Unrivalled Wax bush beans, Asgrow Wonder beet, Tendersweet and Imperator carrots, Purdue Golden Bantam, Golden Cross Bantam, and Kingcross Golden Bantam sweet corns, and the Red Head tomato.

Borax as a fertilizer for celery, E. R. Purvis and R. W. Ruprecht (*Amer. Fert., 83 (1935), No. 6, p. 28*).—As reported by the Florida Experiment Station, the application of 10 lb. per acre of commercial borax was found effective in preventing cracked stem, a disease of celery characterized by crosswise cracks or breaks in the outer layer of the stalks. Since amounts as low as 30 lb. per acre were distinctly harmful, the authors advise against using more than the specified 10 lb. Good results were secured by spraying the borax in water solution on to the soil, and in the 10-lb. application did not damage the foliage.

The presence in self-blanching celery of unsaturated compounds with physiological action similar to ethylene, R. C. Nelson and R. B. Harvey (*Science, 82 (1935), No. 2119, pp. 133, 134*).—At the Minnesota Experiment Station a marked curvature of the topmost leaves, and less in the case of the lower leaves, was noted in potted tomato plants placed in bell jars with a certain amount of the stalks and leaves of Golden Self-Blanching celery. With no celery or with green Winter Queen celery no curvature was produced, suggesting that only celery of the blanching type produced the substance responsible for the curvature. Presumably the natural blanching in celery is the result of a process similar to that induced artificially by ethylene. Propylene, butylene, amylene, mesityl oxide, and vinyl acetate were among the compounds found to induce the same curvature.

Physical and chemical properties of the soluble polysaccharides in sweet corn, M. W. Parker (*Plant Physiol., 10 (1935), No. 4, pp. 713–725, fig. 1*).—At the Maryland Experiment Station water-soluble polysaccharides obtained from the pulp scraped from sweet corn kernels harvested in the milk stage were divided by electrodialysis into two major fractions, one of which (designated as "alpha") migrated to the positive electrode, where it was deposited as a gelatinous mass. The second fraction, designated as "beta", remained in suspension. Attempts to determine the molecular weights of the two fractions by the cryoscopic method failed to yield any consistent results. When comparisons were made of the physical and chemical properties of the alpha and beta fractions with alpha and beta amylose prepared from sweet corn starch there were observed many similarities. The properties of the two fractions were not similar to any of the dextrins resulting from starch hydrolysis.

Light as a factor influencing the dormancy of lettuce seeds, A. L. Shuck (*Plant Physiol., 10 (1935), No. 1, pp. 193–196*).—At the New York State Experiment Station it was observed that dormancy in lettuce seeds may be broken by merely placing the seeds in a moisture-saturated atmosphere and giving them 10 hours' light exposure. The importance of light was shown in 98 and 8 percent of germination in seed receiving moisture and light and moisture alone, respectively. Good results were secured with very brief light exposure when the seeds were moistened previously in saturated air. The retention of germinating capacity by the treated seeds upon drying was found dependent upon the physiological condition of the seed, the period of light exposure, the temperature, and the method of drying. The shorter wave lengths of the visible spectrum were more effective than daylight in producing a dormant condition in presoaked and humidified seed when they were again dried in light. It is believed that light does not facilitate the passage of any substance from the seed but induces certain unknown photochemical changes within the seed.

The influence of soil reaction upon the growth of the tomato plant, M. M. Parker (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 544, 545*).—The average green weight per vine for Marglobe tomatoes planted in midsummer on the soil reaction plats of the Virginia Truck Experiment Station were 1.88±0.09, 1.62±0.11, 2.1±0.11, 3.44±0.12, 3.13±0.21 3.81±0.13, and 2.86±0.12 lb., respectively, for the pH ranges of 4.45 to 4.6, 4.8 to 5, 5.2 to 5.4, 5.55 to 5.75, 6 to 6.2, 6.2 to 6.4, and 6.75 to 6.85. Below pH 5 the growth rate was retarded greatly, resulting in a dull, grayish-green color with sparse foliage located mainly at the ends of the branches.

The influence of nitrate and ammonium nitrogen on the growth of greenhouse tomatoes in soils of different reaction, I. C. Hoffman (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 541–543*).—Tomato plants growing in the Ohio Experiment Station greenhouse in composted soil adjusted with either limestone or sulfur to pH values of 7.8 to 8, 6.5 to 7, and 5 to 5.5 were treated alike with phosphorus and potassium but differently with nitrate of soda and ammonium sulfate in equivalent amounts. With the fall crop ammonium sulfate tended to produce on the alkaline soil larger fruits and a greater total weight of fruit. On neutral soil nitrate of soda produced more fruits with little difference between the two nitrogen treatments in grade or weight of individual tomatoes. On the acid soil nitrate of soda produced more fruit, but the percentage of first-grade fruits was somewhat smaller. In the spring crop nitrate of soda was more effective on the alkaline soil than in the case of the fall crop, producing a slightly larger total weight of fruit. On the neutral and acid soils ammonium sulfate was superior to nitrate of soda. In general conclusion the author suggests that sulfate of ammonia appears as effective as nitrate of soda for greenhouse tomatoes, except possibly on recently sterilized soils moderately acid in reaction.

The variation in temperature of tomatoes and their color development, J. H. MacGillivray (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 529–531*).—Readings by the Indiana Experiment Station on the internal temperature of tomato fruits growing in the field showed the temperature to vary directly with that of the air. Fruits well protected by leaves might be 13° to 25° F. cooler at noon than those exposed to direct insolation, and the side exposed to sunlight was materially warmer than the shaded side. The fact that field-grown tomatoes colored fairly satisfactorily despite occasional internal temperatures as high as 90° is believed due to the lower night temperatures, which may permit lycopin to develop during a greater part of the 24-hr. period.

Effect of irrigation, degree of maturity, and shading upon the yield and degree of cracking of tomatoes, H. D. Brown and C. V. Price (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 524–528*).—A comparison at the Ohio State University of the yield of Pritchard tomato plants picked when the fruits were in the green ripe and full ripe stages showed a greater production of green-picked fruits in the early part of the season, with the total or final sets approximately equal. Observations on the effect on cracking of the application of 2 qt. of water daily to each of four shaded and four unshaded plants showed a beneficial effect of the shade, but the water apparently increased the degree of cracking, due mostly to the increase in weight of the lower-grade fruits. The greener the fruit was picked the less the degree of cracking. However, at none but the very immature stages were all the fruits entirely free of cracking.

Artificial light as an aid to tomato grading, F. C. Gaylord and J. H. MacGillivray (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 532–535*).—Observations by the Indiana Experiment Station on the effect of different kinds of light on the accuracy of tomato grading by commercial workers showed much smaller differences than were anticipated, probably because the workers established more or less unconsciously color standards for each light environment. There were, however, a greater number of mistakes under frosted lamps than with any other types, and the workers themselves reported greater fatigue in the frosted lamp light. On the other hand workers were generally positive in their preference for daylight lamps. The results led the authors to recommend correctly selected lamps as a help in the grading of agricultural products involving a consideration of color.

Root studies.—VI, Apple roots under irrigated conditions, with notes on use of a soil moisture meter, W. S. Rogers (*Jour. Pomol. and Hort. Sci., 13 (1935), No. 3, pp. 190–201, pls. 4, figs. 2*).—In this further contribution (E. S. R., 72, p. 334), the author presents observations recorded while stationed in British Columbia on the root growth of irrigated apple trees, with particular attention to an 8-year-old McIntosh on seedling roots. This tree had average branch and root spreads of 3.55 and 8 m, respectively, and the deepest roots reached 1.46 m. The branch to root weight ratio was 1.99. The roots of 175 3-year-old trees on Canada Baldwin piece roots showed great variability, even when the same variety was grafted thereon. None of the scion varieties exercised a marked influence on the seedling roots. Considerable scion rooting was observed in most of the varieties. A continuous-reading soil moisture meter is described.

Leaf relations of fruit trees.—II, The census method for recording summer growth, with special reference to the apple, M. C. Vyvyan (*Jour. Pomol. and Hort. Sci., 13 (1935), No. 3, pp. 202–219, figs. 11*).—In this second contribution (E. S. R., 68, p. 761), a rapid and effective method of recording summer growth of trees is discussed. Different types of growth were classified into categories on the basis of easily distinguishable characters and each category given a letter. With the aid of a typewriter so equipped that the keys are connected with recording counters, the number of growths are automatically totaled and mapped.

Winter injury to apple trees in eastern Canada, 1933–35, D. S. Blair (*Sci. Agr., 16 (1935), No. 1, pp. 8–15; Fr. abs., pp. 14, 15*).—In presenting information on the extent and nature of winter injury following the severe winter of 1933–34 and the effects on cropping, the author points out that killing and injury were aggravated by a lack of maturity of the tissues at the time of the freeze. This hypothesis was supported by the fact that potted apple trees placed in a frost-proof cellar on November 14 were already so severely injured that 80 percent were killed. Observations in an experimental rootstock orchard at Ottawa showed significant differences in hardiness of the scion varieties but not between varieties of understocks. Site as influencing air drainage was an important factor. The repeated back-crossing of seedlings obtained originally from crosses of Siberian crab with horticultural varieties to their better quality parents resulted in several apples described as extremely hardy and of good eating quality. The top-working of varieties such as McIntosh and Melba on hardier varieties such as Antonovka, Anis, and Charlamoff is suggested as a means of increasing the resistance of apple trees to winter injury.

Physiology of apple varieties, A. H. Finch (*Plant Physiol., 10 (1935), No. 1, pp. 49–72, figs. 6*).—Studies at the Wisconsin Experiment Station of samples of terminal shoots collected at 5-day intervals throughout the spring and summer from apple varieties of (1) typically biennial bearing habit, such as Wealthy and Oldenburg, (2) annual fruiting varieties, such as McIntosh, and (3) shy fruiters, such as Northern Spy, gave evidence that the fruiting performance of an apple tree is dependent primarily upon nutritional conditions within the tree rather than on any specific environmental influence. The degree of vegetativeness was closely related to the chemical composition, particularly of carbohydrate and nitrogen compounds. Starch and total carbohydrate contents and the starch-nitrogen and the total carbohydrate-nitrogen ratios were highest in fruiting terminals and lowest in the unfruitful terminal shoots of biennial bearing varieties. Terminal growth, accumulation of starch, and formation of xylem were initiated earlier and proceeded more rapidly during the early part of the growing period in fruitful than in unfruitful terminal shoots of biennial varieties. Summer wood formation in the xylem was associated with carbohydrate accumulation. Fruitfulness was correlated with the character of the terminal growth, growth rate and period, rate and period of xylem formation, presence of summer wood, cell distribution in the xylem, and chemical composition. The results are said to indicate that the chemical composition of the terminal shoots may be used as an index to the cultural needs of the apple tree.

Preliminary study of the effect of a series of temperature changes upon respiratory activity of apples during the post-climacteric in senescent decline, C. A. Eaves (*Sci. Agr., 16 (1935), No. 1, pp. 28–39, figs. 7; Fr. abs., p. 39*).—Employing the weighed tube method of estimating carbon dioxide in a moving air stream, the metabolic drift of Bramley Seedling apples during the senescent phase was recorded at temperatures of 3°, 10°, and 18° C. Respiratory activity was characterized by a rise in carbon dioxide output up to the climacteric, followed by a decline. The length of life of the apple and the onset of the climacteric in terms of carbon dioxide output were in inverse ratio to the rise in temperature. Fungus invasion caused a rise in the curve of respiration. The studies indicated that a uniform average temperature of 10° is more favorable to the life of apples than sharp upward fluctuations from 3°, although fruit kept longest at the lower temperature.

Storage of Yellow Newtown apples in chambers supplied with artificial atmospheres, F. W. Allen and L. R. McKinnon (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 146–152*).—Observations at the California Experiment Station at Davis on fruits from a single tree stored at 36° and 42° F. in large glass bottles in which the percentages of carbon dioxide were increased to 5, 10, and 15 showed after 3 mo. of storage that the gas-stored were still too firm for best eating, while those in ordinary air at both temperatures were fully ripe. The flesh of the 10 and 15 percent carbon dioxide apples was slightly woody, but no discoloration or off-flavor could be detected. About 2 mo. later the air-stored apples were practically worthless, whereas the gas-stored fruits showed no injury and the 5 and 10 percent lots were crisp and firm. As late as May 12 the fruits in 10 percent carbon dioxide were still moderately crisp and juicy. Analyses of fruit of the March and May samplings showed no marked or constant differences in sugar, but the percentage of malic acid was lower in the normal-air lots.

Seasonal changes in Bartlett pear leaves, L. D. Davis and N. P. Moore (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 131–138, fig. 1*).—Using leaves collected during the entire growing period from nonfruiting spurs from 2 to 3 yr. old, the authors found in this study at the California Experiment Station at Davis that on a percentage dry weight basis there was a rather large accumulation of calcium throughout the season, attaining a maximum in the leaves as they were becoming yellow and ready to fall. Magnesium present in only small amounts appeared to accumulate slightly during the season. Potassium decreased during the early stages, remained more or less constant until near the end of the season, and then decreased rapidly. Phosphorus decreased rapidly during the early period and then remained more or less constant throughout the season. Nitrogen decreased from the first to the last sample, the most rapid decline preceding natural leaf fall.

Some factors affecting fruit set in pears, W. W. Aldrich (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 107–114*).—Stating that light fruit setting, particularly in the Anjou pear, is often a limiting factor in production in the Rogue River Valley, Oreg., the results are discussed of various pollination, thinning, nitrogen, and pruning treatments employed in an effort to increase the set in Anjou, Bartlett, and other varieties. Although pollination by hand increased the early set on Anjou and Bartlett, such treatments had little effect on the final set, indicating an insufficient nutrient supply to maintain the increased set. The results of fruit thinning experiments indicated that thinning one year may increase the set the next, especially in the case of less vigorous trees. Attempts to increase the set by applications of ammonium sulfate and nitrate of soda gave no striking results, but suggested that on certain soil even with a rye-vetch cover the withholding of nitrogen may bring about at the end of 2 yr. a limitation in fruit set. Heavy as compared with light pruning gave significant increases in final set of Anjou, Bartlett, Beurre Bosc, and Winter Nelis. The results from defloration as well as pruning indicated that both the removal of fruit buds and of wood are important in increasing the set following the heavier pruning treatments.

Evaporating power of the air and top-root ratio in relation to rate of pear fruit enlargement, W. W. Aldrich and R. A. Work (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 115–123, figs. 3*).—The determination of an inverse relation between the evaporating power of the air and the rate of fruit enlargement of pears on heavy Medford, Oreg., soils which were well above the permanent wilting percentage is said to indicate that during the periods of high transpiration leaves lose water at a greater rate than can be supplied by the roots. When the ratio of root area to leaf area was increased by the removal of part of the leaves, the water supply to the remaining leaves and fruit was increased. The authors suggest that when the available soil moisture is reduced to 35 or 40 percent of the available capacity the moisture supply to the leaves during periods of relatively high transpiration is limited by the amount of root area.

The course of stone cell formation in pear fruits, W. W. Smith (*Plant Physiol., 10 (1935), No. 4, pp. 587–611, figs. 8*).—Observing the changes in the amount of lignocellulose, total sugars, reducing sugars, and total and soluble pectins as percentages of the dry weight, the Michigan Experiment Station found that in maturing Kieffer pears there was a great decrease in the percentage of lignocellulose, accompanied by an equally great increase in the percentage of reducing materials. The same trend, but to a lesser degree due to the smaller amount of lignocellulose, was observed in the Bartlett pear and the Wagener apple. However, later studies with the Kieffer pear and the Wagener apple showed no actual decrease in absolute amounts of lignocellulose, although because of the great increase of alcohol soluble materials the percentage actually decreased. There was no evidence that lignified tissues break down into less complex forms. Grit was not actually reduced but was apparently masked by other constituents. Some evidence was seen that sugars may be built up into lignified tissues. The marked decrease of hemicellulose in storage is believed to indicate that these may be the source of respirable materials after harvesting. The suggestion of Crist and Batjer (E. S. R., 65, p. 739) that the grower has little control over grittiness in pears beyond the selection of varieties is supported.

Sugar and acidity changes in pears as influenced by variety and maturity, F. Gerhardt and B. D. Ezell (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 141–145, fig. 1*).—Observations at the Wenatchee (Wash.) laboratory of the U. S. Department of Agriculture on several varieties of pears harvested at three stages of maturity, namely, early, commercial, and late, showed glucose to reach a maximum in all five varieties at the first picking and to decline from there on. Fructose attained its maximum during the second harvest period in Bartlett, Flemish Beauty, and Anjou but increased throughout the entire harvest range in Beurre Bosc and Comice. In all varieties sucrose increased rapidly after the commercial harvest, being particularly abundant in the Bartlett and Beurre Bosc. Fructose and sucrose are believed to represent the accumulative forms of sugar in pears and to have their source in the hydrolysis of starch. The so-called index figure, the ratio between dissociated and total acids, computed for the several varieties at the three different stages of maturity was found to be a promising sensitive physiological index to maturity.

Observations on the cracking of cherries, Z. I. Kertesz and B. R. Nebel (*Plant Physiol., 10 (1935), No. 4, pp. 763–772, fig. 1*).—Observations at the New York State Experiment Station on several varieties of cherries showed that the size of the subepidermal cells is appreciably smaller in varieties whose fruit is prone to crack during ripening than in varieties which do not crack. In varieties with a cracking tendency the large parenchymatous cells of the flesh were more frequently interspersed with smaller cells, whereas in noncracking varieties the cell size was more uniform. No correlation was established between cracking tendency and cell size in the epidermis, but thickness of the inner wall of the epidermis was positively correlated with cracking. All varieties took up water when immersed in water or sucrose solutions, but as a group the noncracking varieties took up much less. Both the rate and extent of cracking were diminished when fruits were immersed in sugar solutions as compared with water. In a 28.2 percent sucrose solution no cracking occurred.

Determination of the nitrogenous fractions in vegetative tissue of the peach, O. W. DAVIDSON and J. W. SHIVE (*Plant Physiol., 10 (1935), No. 1, pp. 73–92*).—Observing that the presence of nitrogenous glucosides in the vegetative tissues of the peach interfered with the use of the usual methods of determining the nitrogenous fractions, the authors, at the New Jersey Experiment Stations, developed suitable modified methods. No hydrocyanic acid was liberated when dormant or slowly growing peach stems were minced rapidly and boiled according to an approved method. Using the same procedure, the terminal portion of moderately or rapidly growing peach stems liberated very small to very appreciable quantities of hydrocyanic acid. The cyanogenetic nitrogen present in peach extracts never was completely liberated during hydrolysis with various concentrations of sulfuric acid and different lengths of boiling. Since during aspiration with 0.65 percent sodium hydroxide the cyanogenetic nitrogen may be more or less completely hydrolyzed to ammonium nitrogen, it was found necessary in determinations of ammonium nitrogen and amide nitrogen to first remove the cyanogenetic nitrogen. In an alkaline solution the hydrolysis of cyanogenetic nitrogen to ammonium nitrogen was almost completely prevented by adding a soluble iron salt to the peach extract. When the emulsin present in green peach tissues was destroyed quickly, no loss of nitrogen occurred during the drying of stem material. Under like conditions root material lost slight but not appreciable amounts of nitrogen.

Factors influencing the refrigeration of packages of peaches, J. W. LLOYD and S. W. DECKER (*Illinois Sta. Bul. 418 (1935), pp. 437–464, figs. 11*).—Following the same procedure as outlined for an earlier study with apples (E. S. R., 72, p. 776), the authors found that Elberta peaches packed in lined tub bushel baskets held at a temperature of 34° F. did not develop as great temperature differences between outside and center rows of fruit as did Grimes Golden apples held under comparable conditions. The peaches cooled more rapidly than did the apples during the early stages, but after 6 to 8 hours in the chamber the apples cooled faster. The air temperature between the outer and second rows was about midway between the fruit temperature of the two rows, whereas between the third and fourth rows the air temperature was below that of the fruit in the third row. The rate at which fruit within a basket cooled was largely dependent upon the difference between the temperature of the air surrounding the fruit and that of the fruit itself. The size of peaches did not materially affect the rate of cooling. The use of ventilated liners in well-constructed tub baskets did not greatly interfere with the cooling of the fruit. Peaches packed in lined tub bushel baskets and in ventilated corrugated bushel boxes cooled at approximately the same rate. Fruit in lined half-bushel containers cooled more rapidly than in lined tub bushel baskets. Fruit in an unlined ventilated bushel basket cooled to 50° in half the time required for lined tub bushel baskets. The use of oiled wraps retarded materially the cooling of peaches.

Some ash constituents of alternate-bearing Sugar prune trees, L. D. DAVIS (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 125–130, figs. 4*).—In this further contribution from the California Experiment Station at Davis (E. S. R., 64, p. 740), dealing with a prune variety of almost complete alternate bearing habit, the author presents data relating to the calcium, magnesium, and potassium contents of the ash of different parts of the tree. The presence of a crop of fruit reduced the potassium and phosphorus contents of the wood, bark, and spurs, and the potassium content of the leaves. There were, however, no differences in the phosphorus content of the leaves of bearing and nonbearing trees. Calcium was higher in the bark, spurs, and leaves but lower in the wood of bearing than nonbearing trees. The amount of magnesium was small, with no apparent difference in the amount in the bark, wood, and spurs of the two types. The author points out that the results of the investigation show that analyses of one portion of a tree may not adequately show the relative quantities present in other portions.

The cool storage of plums, G. B. Tindale, S. A. Trout, and F. H. Heulin (*Jour. Dept. Agr. Victoria, 33* (*1935*), *No. 11, pp. 552–554*).—Stimulated by the generally poor condition on arrival of overseas shipments of Victoria-grown plums, fruits of several varieties picked in the immature and approaching maturity stages were promptly stored in the Government Cool Stores at Melbourne at 31° and 34° F. The longest storage life was observed at 31° ; in fact at 34° storage life was approximately 25 percent shorter. The first indication of the breaking down of stored fruit was a general mealiness associated with loss of flavor. Plums picked in the immature stage, although taking on color, never did attain eating quality. As a class the *Prunus domestica* varieties kept longer than the Japanese, the longest keeper of the 10 varieties tested being Golden Drop, which held for 8 to 9 weeks. Increases in the carbon dioxide of the storage atmosphere decreased the life of the plums.

Growth of fruit tree stocks as influenced by a previous crop of peach trees, W. H. Upshall and G. N. Ruhnke (*Sci. Agr., 16* (*1935*), *No. 1, pp. 16–20, figs. 4; Fr. abs., p. 20*).—Striking differences were observed at the Ontario Horticultural Experiment Station, Vineland, in the growth of nursery stock planted on an area from which a peach orchard had been removed. Measurements showed that the areas of weak growth coincided almost exactly with the former location of the trees. By 1933, 6 yr. after the removal of the peaches and when all old peach roots were almost completely disintegrated, it was still possible to detect the location of peach trees by the inferior growth of the young nursery stock. Chemical studies of soil samples collected in December 1933 showed a clearly defined difference in readily soluble phosphorus in favor of the nonpeach tree locations. In April nitrates were somewhat higher in the intervening spaces, but later samples showed no differences. Water-soluble potassium was distinctly higher in the surface 6 in. of the intervening spaces except on one date of sampling, May 2. On the whole there were no striking differences in chemical composition, and the author suggests the possibility that the probable depression of nitrification from the decomposition of the old peach roots, together with a diminished supply of phosphorus and potassium, may have been a major factor in promoting the different growth statuses.

Availability of nutrients in raspberry plots in relation to winter injury, J. J. Woods (*Sci. Agr., 16* (*1935*), *No. 1, pp. 1–7, figs. 2; Fr. abs., p. 7*).—Cuthbert raspberries growing at the Dominion Experimental Farm, Agassiz, B. C., responded markedly in growth to manure and complete fertilizer, but in a critical winter, in which a rapid drop in temperature followed a very mild, late autumn, the more vigorous, well fertilized plants suffered much more injury than the unfertilized. The manured and fertilized plants branched more freely, and within a given treatment the branched canes suffered more injury than the unbranched. The yields in the 2 yr. preceding the freeze were comparatively uniform in all plats.

Growth modifications in citrus seedlings grown from X-rayed seed, C. P. HASKINS and C. N. MOORE (*Plant Physiol., 10 (1935), No. 1, pp. 179–185, figs. 7*).—Descriptions are presented of certain morphological variations, such as premature flowering, albinism, fasciation, twisting, and duplication of leaflets, observed in the Research Laboratory of the General Electric Company in citrus seedlings produced from seed treated with X-rays prior to planting.

Maturity and quality in acid citrus fruits, H. P. TRAUB and T. R. ROBINSON (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 139, 140*).—The results are presented of analyses by the U. S. Department of Agriculture of several varieties of limes and lemons for percentages of acid, solids, and extractable juice. Perrine lemons grown on rough lemon roots had from 9.5 to 10.9 percent of solids as compared with 12.4 percent for the same variety on sour orange. Calculations showed a negative correlation between total rainfall and the amount of acid present in limes and lemons.

Relationship between nitrogen fertilization and chlorophyll content in pineapple plants, R. K. TAM and O. C. MAGISTAD (*Plant Physiol., 10 (1935), No. 1, pp. 159–168, figs. 2*).—Determinations at the University of Hawaii of the total chlorophyll in leaves from ferrous sulfate sprayed pineapple plants receiving differential nitrogen treatments, all ammonium sulfate, showed that despite appreciable natural variation in the concentration of chlorophyll in the leaves from a single fertilizer treatment there was in general with every increase of nitrogen applied a corresponding increase in chlorophyll. This indicates, according to the authors, that in the pineapple plant the amount of available nitrogen present determines to a large degree the amount of chlorophyll formed, provided that other requirements, such as light, iron, and magnesium, are adequate.

Carotene and xanthophyll in pineapples, O. C. MAGISTAD (*Plant Physiol., 10 (1935), No. 1, pp. 187–191*).—Stating that the color of pineapple flesh ranges from white to deep yellow and that within commercial varieties, such as Cayenne and Hilo, the color varies from field to field and even in a single field, the author discusses the results of studies at the University of Hawaii upon several varieties and hybrids, in which it was found that the yellow color is due to the presence of carotene and xanthophyll, with the former predominant. The quantity of carotene ranged from about 0.1 to 0.25 mg per 100 g of flesh.

Progress report on nut growing in the Ithaca, N. Y., region, L. H. MACDANIELS (*North. Nut Growers Assoc. Proc., 25 (1934), pp. 31–34*).—Information is presented on the behavior of various nuts, including black walnut, hickory, Persian walnut, and Chinese chestnut, on the Cornell University grounds. During the 1933–34 winter most Persian walnuts were killed outright, and Chinese chestnuts were seriously injured. Japanese walnuts were not damaged seriously by the winter cold but were hurt by late spring frosts. Hickories and black walnuts for the most part showed no injury except in the case of rapidly growing grafts.

Winter injury of filberts at Geneva, 1933–34, G. L. SLATE (*North. Nut Growers Assoc. Proc., 25 (1934), pp. 36–40*).—Following a winter minimum of −31° F. on February 9, severe wood injury was recorded in many of the varieties of filberts growing at the New York State Experiment Station. There were, however, a number of varieties in which the wood was fairly hardy. Pistillate flowers were hardier than the catkins, and nearly all varieties showed at least an occasional female flower. Hybrids between the European and American species were particularly hardy and are considered promising as material for further breeding.

Some notes on the hardiness of the English walnut in Michigan and Ontario, J. A. Neilson (*North. Nut Growers Assoc. Proc., 25 (1934), pp. 55–61*).—The winter of 1933–34, characterized by extreme cold following a warm, wet autumn, caused severe injury to Persian walnuts growing in Michigan. Information is presented on varietal behavior, types of winter injury, and possible methods of culture for reducing injury in the future.

Lilies: Their culture and management, H. D. Woodcock and J. Coutts (*London: Country Life Ltd.; New York: Charles Scribner's Sons, 1935, pp. XV+242, pls. 99*).—Supplementing the general information, there is included a complete descriptive list of species.

Lilies and their culture in the garden, G. L. Slate (*N. and S. Dak. Hort., 8 (1935), No. 12, pp. 138, 139, 140, 141, 143*).—This comprehensive discussion includes information on species, propagation, planting, disease control, etc.

FORESTRY

A general introduction of forestry in the United States, with special reference to recent forest conservation policies, N. C. Brown (*New York: John Wiley & Sons; London: Chapman & Hall, 1935, pp. XIX+293, pl. 1, figs. 139*).—Forest growing and forest utilization are discussed in detail.

Trees and erosion control, A. C. McIntyre (*Amer. Soil Survey Assoc. Rpt., 15 (1934), pp. 110–114*).—This article, a joint contribution from the Soil Erosion Service, U. S. Department of the Interior, and the Pennsylvania Experiment Station, presents preliminary data on the growth rate of different species, the effectiveness of the crowns in protecting soil from beating rains, the amount and value of tree litter and humus, and the extent and effectiveness of the root systems of different species.

What are the largest trees in the world? H. D. Tiemann (*Jour. Forestry, 33 (1935), No. 11, pp. 903–915, figs. 5*).—Based on information obtained from various sources, authoritative data are presented on the location and identity of the largest trees in the world. In height the outstanding species of living trees are said to be the redwoods, the eucalypts, and the Douglas firs. Volume supremacy is conceded to lie between the redwood of California and the kauri (*Agathis australis*) of New Zealand.

A new variety of black locust, B. Y. Morrison (*Science, 82 (1935), No. 2127, pp. 326, 327*).—A brief note is presented on the occurrence in New England and adjacent areas of a strain of locust with particularly straight stem and exceptionally durable wood when placed in contact with the soil. The bark and flower characters differ from those of any described variety. The name *Robinia pseudoacacia rectissima* is suggested.

Collection of yellow poplar seed, E. Hinson (*Jour. Forestry, 33 (1935), No. 12, pp. 1007, 1008*).—A brief description is presented of methods of collecting seed involving the spreading of a large cloth beneath the tree from whose branches the seeds were shaken by hand.

Seedlings or transplants? P. O. Rudolf and S. R. Gevorkiantz (*Jour. Forestry, 33 (1935), No. 12, pp. 979–984*).—In the fall of 1931 on four different sites in the Huron National Forest, Mich., 2-yr. Norway pine seedlings were planted alternately with Norway pine transplants 2 yr. in the seed bed and 1 yr. in the transplant bed. At the time of planting, the total weights of both classes were in the ratio of 2.69 to 7.94, respectively. At the end of the third growing season survival and height records showed statistically that the transplants were significantly superior in both respects, and the poorer the site the more striking the differences. From the standpoint of cost of establishment the authors concede that the transplants were more economical under the conditions of the Lower Michigan sand plains.

Saw versus pruning shears, R. C. Hawley and R. T. Clapp (*Jour. Forestry, 33 (1935), No. 12, p. 1009*).—A shearing tool with two sharp blades which permit cutting as close to the stem as is possible with a saw is described, with favorable comments.

Winter injury to hardwoods in 1933–34, J. A. Cope (*Jour. Forestry, 33 (1935), No. 11, pp. 939, 940*).—Following the drastic winter of 1933–34, marked injury was observed in 5- and 6-in. sugar maples and beeches growing on exposed sites in the Adirondack Mountains, whereas hemlock, spruce, and yellow birch were apparently uninjured. In a location about 8 miles south of Canton, N. Y., where a minimum of −34° F. occurred on December 29, maple and white ash were killed back to the ground or snow line, while basswood survived with no apparent damage.

Clear cutting for acid wood in Delaware County, N. Y., J. A. Cope (*Jour. Forestry, 33 (1935), No. 11, pp. 938, 939*).—On a 5,000-acre commercial project clear cutting in narrow blocks up and down the steep slopes gave excellent results, as manifested in the density and composition of the restocking. Sugar maple and yellow birch, both aggressive reproducers and also desirable from the standpoint of acid wood production, were prominent in the reproduction.

DISEASES OF PLANTS

Handbook of plant diseases, I, founded by P. Sorauer (*Handbuch der Pflanzenkrankheiten. Berlin: Paul Parey, 6 ed., rev., 1934, vol. 1, pt. 2, pp. VIII+553, figs. 147*).—The first part of this volume has been noted (E. S. R., 70, p. 789). Part 2 (edited by O. Appel, with the collaboration of K. Braun, E. Hiltner, E. Köhler, F. Merkenschlager, H. Morstatt, K. O. Müller, E. Pfeil, O. Schlumberger, E. Tiegs, and H. Wartenberg) concludes the nonparasitic diseases and adds the virus diseases (183 pp.), which in the fifth edition constituted 72 pages under the heading "enzymatic diseases" (E. S. R., 61, p. 532).

Under the nonparasitic diseases are considered those due to inner factors (developmental or functional disturbances in the embryonic, vegetative, or reproductive periods), troubles due to unfavorable physical or chemical relations of soils, wounds (their causes, plant reactions to them, regeneration and correlation after wounding, and the effects of wounds on the general development of plants), smoke injuries, and injuries due to sewage and factory waste water.

The first part of the final section gives a general discussion of the virus diseases, including the etiological relations; the pathological anatomy, histology, and physiology; the behavior of viruses within the plant; their transmission; the course of virus diseases in relation to the environment; resistance to them; virus relations in vitro; their classification; and control measures. The final and special part of this section discusses in detail the specific virus diseases of the Solanaceae (tobacco, potato, and tomato) and 37 virus diseases of nonsolanaceous plants.

Numerous page footnote references to the literature and a copious subject index are provided.

The Plant Disease Reporter, November 15, 1935 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 19 (1935), No. 19, pp. 294–305, fig. 1*).—The following items of interest are included:

Tobacco diseases in the field, 1935, reported by P. J. Anderson, G. M. Armstrong, W. S. Beach, E. E. Clayton, J. G. Gaines, L. O. Gratz, R. G. Henderson, J. Johnson, P. R. Miller, and R. F. Poole; symptoms of *Fusarium* wilt of potato in Minnesota this year (the general appearance of the disease being somewhat similar to that reported for wilt due to *F. eumartii* in wet weather, but the fungi isolated more closely answering the description of *F. oxysporum*), by J. G. Leach and H. Darling; white pine blister rust found in Illinois and Indiana (being the first record for Illinois and the second for Indiana), reported by the U. S. D. A. Bureau of Entomology and Plant Quarantine; *Verticillium* wilt of maple in California (being apparently the first record of a *Verticillium* on maple in California and the first report of this fungus on *Acer macrophyllum*), by J. L. Mielke; and smut found on *Calendula* in Oregon (being apparently the first record of *Entyloma calendulae* on *Calendula* for the United States), by F. P. McWhorter.

[Plant disease studies in Illinois] (*Illinois Sta. Rpt. 1934, pp. 53, 54, 56, 57, 64, 65, 213–215, 218, 219, 225, 226, 229, 230, figs. 2*).—Reports are included on tests by B. Koehler et al. of inbred lines and individual plant matings of corn for resistance to *Aspergillus flavus*, injury to seed corn pericarps, seed treatments with formaldehyde and by ethyl-mercury-phosphate for control of oat smut, and seed treatments of wheat and barley; apple measles, the development of pear varieties resistant to fire blight, suggestions for the control of blossom blight on apples, leaf drop and lowering of fruit quality in peaches caused by lead arsenate and lime sprays, and overwintering of *Phytomonas pruni*, causing peach leaf spot, in certain twigs and water sprouts, all by H. W. Anderson; a black-stele root rot and wilt in strawberries, by Anderson and A. S. Colby; and raspberry diseases, by Anderson and K. J. Kadow.

Protecting plants from diseases (*Wisconsin Sta. Bul. 430 (1935), pp. 15–32, figs. 3*).—Data from the following studies are here reported: The effectiveness of copper-lime-arsenite preparations against fungus fruiting structures at or very near the surface of diseased plant parts, by G. W. Keitt and D. H. Palmiter; control methods for fire blight of apple trees, by Keitt and J. A. Pinckard; bordeaux mixture (3–4–50) for control of cherry leaf spot, by Keitt and E. C. Blodgett; causes of abnormal growths (galls, tumors, and cancers) in plants, by A. J. Riker et al.; smut-resistant hybrid strains of oats developed by B. D. Leith, H. L. Shands, and J. G. Dickson; a preliminary survey of the amount of stalk rot of corn in southern Wisconsin (1934), by Riker, Dickson, and R. O. Magie; the development of sweet corn hybrid strains resistant to bacterial wilt, by S. S. Ivanoff, Riker, and Dickson; promising strains of yellows-resistant cabbage, by J. C. Walker and L. M. Blank; yellows resistance in cabbage plants, studied by M. E. Anderson and Walker; the discovery of cabbage mosaic in the greenhouse during the spring of 1934 and its general prevalence in southern Wisconsin during the following summer, by Blank and Walker; field tests by Walker and R. H. Larson of calcium cyanamide for control of cabbage clubroot; studies by M. W. Stubbs and Walker on pea mosaic and by W. C. Snyder on "near-wilt" of peas due to *Fusarium oxysporum* f. 8; studies by Walker of the mosaic-resistant Wisconsin Refugee and Idaho Refugee bean varieties; field studies by Walker of certified seed potatoes in reducing the losses due to yellow dwarf; the control of potato scab, studied by A. R. Albert, J. G. Milward, and Walker; rugose mosaic control methods, by K. Koch and J. Johnson; and extensive tests by I. A. Hoggan of the role aphids play in the introduction of ordinary tobacco mosaic into tobacco fields. Some of the work was in cooperation with the U. S. Department of Agriculture.

Progress report of the Dominion botanist, H. T. Güssow (*Canada Expt. Farms, Div. Bot. Rpt., 1931–34, pp. 14–86, fig. 1*).—These pages contain progress reports summarizing the results of investigations on the following projects: Cereal diseases (rusts, smuts, root rots, field maintenance of fungus diseases for experimental purposes, effect of fertilizers on diseases, and pseudoblack chaff); forage crop diseases (root crops, clovers, and sunflowers); diseases of ornamentals; forest pathology; fruit diseases; mycological studies; potato diseases; vegetable diseases (tomatoes, celery, onions, eggplants, sweet corn, and lettuce); and miscellaneous plant diseases, including surveys, diseases of intercepted plant importations, ginseng root rot, testing of spray materials, hop diseases, fermentation studies on fruit juices and wines, soil treatments for clubroot of crucifers and for various diseases of potatoes, certain soil deficiency relations of potatoes and cereals, *Ophiobolus* diseases of *Zostera marina* (eel grass), and tobacco diseases.

Plant diseases and pests in Denmark, 1934 (*Tidsskr. Planteavl, 40 (1935), No. 5, pp. 713–766, figs. 13; Eng. abs., pp. 765, 766*).—Among other pests and diseases discussed, a zonal rot of tulips, reported as new, was found in 38 lots of tulips in 16 localities. Diseased parts contained a fungus belonging to the Pythiaceae (illustrated). Inoculations in February 1934 were partially successful, while others the next fall were negative.

Egyptian plant diseases.—A summary of research and control, G. H. JONES (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 146 (1935), pp. V+45, pls. 8*).—In this manual part 1 discusses the geographical and physical characteristics of the country in relation to plant diseases, and reviews the diseases in general, the chief lines of research work, the adaptation of plant disease control methods to local conditions, and plant disease legislation in Egypt.

In part 2 a list of crop plants and their diseases is arranged alphabetically by common names of hosts. The minor or less known diseases appear with only brief annotations, while the important Egyptian diseases are more fully discussed with relation to incidence, economic importance, and other local data. Control methods are also discussed. The plates are reproductions of posters and advisory sheets distributed to growers for the popularization of data on plant diseases and their control.

Review of phytopharmacy [trans. title], M. RAUCOURT (*Ann. Agron. [Paris], n. ser., 5 (1935), No. 3, pp. 385–406*).—This review deals with the years 1933–34 and follows similar reviews published in 1931 and 1933. In the case of insecticides every material in use is said to have been studied, and among the fungicides several new mineral and organic products were proposed, the former being nearly all copper compounds. Mineral insecticides and fungicides appear to have reached their peak, while organic products, both natural and synthetic, are annually coming into wider use.

A bibliography of 75 titles is included.—(*Courtesy Biol. Abs.*)

First supplement to partial bibliography of virus diseases of plants, J. I. OTERO and M. T. COOK (*Jour. Agr. Univ. Puerto Rico [Col. Sta.], 19 (1935), No. 2, pp. 129–313*).—In addition to the supplementary bibliography, with its subject and author indexes, this contribution contains subject and author indexes and errata to the Partial Bibliography of Virus Diseases of Plants (E. S. R., 72, p. 490).

Host index of virus diseases of plants, M. T. COOK (*Jour. Agr. Univ. Puerto Rico [Col. Sta.], 19 (1935), No. 3, pp. 315–406*).—This index is not intended as a classification of either the diseases or the viruses causing them, but rather as an attempt to bring together the first records of each disease for the convenience of the workers in the virus group. The hosts are entered by scientific names under their respective families, both with alphabetical arrangement.

"Up to the present time more than 5,000 papers and a few books have been published, and virus diseases have been recorded in about 80 families, more than 400 genera, and nearly 1,000 species of plants."

Index of the vectors of virus diseases of plants, M. T. Cook (*Jour. Agr. Univ. Puerto Rico* [*Col. Sta.*], *19* (*1935*), *No. 3*, *pp. 407–420*).—In this annotated list, alphabetically arranged by the binomials of the vectors, the names are, in general, those used by the authors reporting the disease transmission.

Dematophora glomerata and Vialina n. g. [trans. title], M. Curzi (*Bol. R. Staz. Patol. Veg.* [*Roma*], *n. ser.*, *15* (*1935*), *No. 2*, *pp. 235–259*, *figs. 9*; *Eng. abs.*, *pp. 257*, *258*).—Mycelial, pycnidial, sclerotial, and stilboid forms have been variously described since 1887 as different stages of *D. glomerata*. The author isolated these forms, and from the results of his study claims that they constitute three distinct species living together on the same diseased grape roots. The mycelial and pycnidial forms are placed in the Hyalosporae of the Phomaceae and described as *V. glomerata* n. g. and sp. The sclerotial form corresponds very often to the immature perithecia of *Microascus* and is placed under *M. intermedius*. The stilboid (synnema) form corresponds to the conidial stage (*Stysanus glomeratus*) of *M. stysanophorus*.

Inoculations of these forms to sound grape roots gave negative results.

A member of the Phomaceae isolated from dead roots of *Chrysanthemum cinerariaefolium* is described as *V. radicicola* n. sp.

The aecial forms of Berberis aetnensis [trans. title], C. Sibilia (*Bol. R. Staz. Patol. Veg.* [*Roma*], *n. ser.*, *15* (*1935*), *No. 2*, *pp. 355–362*, *figs. 4*).—The author reports two forms of aeciosori on *B. aetnensis* in Italy. One belonged to *Puccinia graminis*, and the determination of the other is in progress.

The dissociation of Fusarium in soil, C. R. Orton (*Bul. Torrey Bot. Club*, *62* (*1935*), *No. 7*, *pp. 413–420*, *pls. 4*).—In this investigation at the University of West Virginia, 4 strains of *F. niveum*, 2 of *F. vasinfectum*, and 1 of *F. tracheiphilum* were grown on rice in Petri dishes and then transferred to sterilized soil (treated or untreated) in flasks. At approximately monthly intervals a sample of the soil was taken from each flask, plated on Leonian's modified agar (composition given), and the resulting colonies were studied.

The results are considered conclusive in showing that several strains of *F. niveum* may dissociate as readily in soil as in laboratory media, and this is believed to have a direct relationship to the large number of strains spontaneously occurring in watermelon soils and also to the variations in pathogenicity. Furthermore, stability and instability are apparently characteristic of particular strains and are purely relative. Some strains of *F. vasinfectum* produced no dissociants over a period of 22 mo., while another strain repeatedly produced two distinct dissociants. Some isolates have continued stable for 4 yr. and then dissociated. Results also indicated the probable influence of temperature and of supplementary soil treatments on dissociation.

The distribution and prevalence of physiologic forms of Puccinia graminis tritici in the Union of South Africa, 1930–1934, L. Verwoerd (*Ann. Univ. Stellenbosch*, *13* (*1935*), *A*, *No. 3*, *pp. 7*).—"In this contribution the author presents the results of a comprehensive physiologic form survey which was conducted during the period 1930–34."

Note on the longevity of spores of the fungus Urocystis tritici Koern., R. J. Noble (*Roy. Soc. N. S. Wales, Jour. and Proc.*, *67* (*1933*), *pp. 403–410*).—Spores of *U. tritici* were exposed to a series of relative humidities at from 13° to 31° C. for 10 yr. During the first 2 yr. germination commenced first in the 50 and 64 percent relative humidity series, and no germination was noted at 72.5 or 89 percent at any time. Viability was lost at 64 percent r. h. after 2 yr. and at 50 percent after 6 yr. Over 50 percent germination was recorded each year over a 10-yr. period in the relative humidity series at from 0 to 33.5 percent.

Plant cancer and anticancerous immunity [trans. title], I. GHEORGHIU (*Ann. Inst. Pasteur, 51* (*1933*), *No. 4, pp. 535–544, figs. 4*).—Of over 300 plants of *Pelargonium zonale* inoculated with *Bacterium tumefaciens*, about 13 percent proved to be naturally immune.

A vaccine against *B. tumefaciens*, prepared by heating young cultures to 60° C., when injected two or three times subepidermally into the stem or applied once in absorbent cotton to the cortical parenchyma from which portions of the epidermis had been removed preimmunized the plants, making it impossible to infect them for 3 mo. thereafter. Repeated applications of the vaccine to healthy tissues or tumorous tissues of affected plants caused the galls to dry up and degenerate from the surface inward until completely inactivated and removable without recurrence. In some cases the vaccine caused general toxic symptoms similar to those in the infected controls. Both preventive and immunizing vaccination were strictly specific, but direct in vitro evidence of specific antibodies was not secured.

The effect of mechanical seed injury on the development of foot rot in cereals, J. E. MACHACEK and F. J. GREANEY (*Canad. Jour. Res., 8* (*1933*), *No. 3, pp. 276–281, figs. 2*).—"Greenhouse and field experiments have shown that the use of mechanically injured seed promotes the development of seedling blight and foot rot caused by *Fusarium culmorum* in cereals, thereby retarding the growth of the plants and decreasing yield."

A new leaf spot on oats, R. SPRAGUE (*Northwest Sci., 9* (*1935*), *No. 3, p. 15*).—This is a preliminary report of studies by the U. S. D. A. Bureau of Plant Industry in cooperation with the Oregon and Washington Experiment Stations of an apparently new leaf spot of oats observed in the States of Oregon (1932) and Washington (1933–34) and shown to be due to an apparently undescribed species of *Pseudodiscosia*. The symptoms of the disease and the cultural characters of the fungus are described.

Specialization of Puccinia triticina in Italy [trans. title], C. SIBILIA (*Bol. R. Staz. Patol. Veg.* [*Roma*], *n. ser., 15* (*1935*), *No. 2, pp. 277–300, figs. 5*).—The author reports controlled tests with 24 single-spore isolations of *P. triticina* from various parts of Italy on 8 standard wheat varieties (Malakoff, Carina, Brevit, Webster, Loros, Mediterranean, Hussar, and Democrat) as demonstrating 9 physiological forms, of which 8 are considered as new biotypes. The types of infection produced by 6 of these biotypes on 14 racial groups of *Triticum vulgare* and 4 of *T. durum* are tabulated and discussed.

Rust, J. H. PARKER (*Northwest. Miller, 183* (*1935*), *No. 3, pp. 237, 247, fig. 1*).—This contribution from the Kansas State College gives a popular review of the history of studies on the rusts of wheat, together with notes on the reactions to stem rust of a number of spring wheats at Manhattan during the current summer, and photographs of 14 varieties of historical or present interest or of promise for the future.

Nature and control of bacterial wilt of alfalfa, C. W. HUNGERFORD (*Idaho State Hort. Assoc.* [*Proc.*], *39* (*1934*), *pp. 154–157*).—This report from the Idaho Experiment Station presents data as showing alfalfa wilt (*Aplanobacter insidiosum*) to be by far the most serious alfalfa disease of the State. In tests with seven varieties, Turkestan showed considerable evidence of resistance. Cossack, Common, and Ladak gave some promise, but did not survive attack as well as Turkestan. Hardigan, French, and Grimm were all susceptible.

The symptoms of the wilt are described, and preventive cultural practices are suggested.

Bacterial blight of beans: The detection of seed infection, R. D. Wilson (*Jour. Aust. Inst. Agr. Sci., 1 (1935), No. 2, pp. 68–75*).—Isolations over a 3-yr. period indicated that *Bacterium medicaginis phaseolicola* apparently is responsible for most, if not all, of the losses by bacterial blight in New South Wales. Tests showed that moderate or severe infection of a seed sample can be demonstrated within a few days by soaking some of the seeds in water for a period less than 24 hr., and then inoculating the infusion into bean pods on growing plants or into fresh pods in a moist chamber.

The influence of manure on attack of cabbage by Peronospora parasitica, H. L. G. de Bruyn (*Tijdschr. Plantenziekten, 41 (1935), No. 3, pp. 57–64, pl. 1; Eng. abs., p. 63*).—The discordant results by other investigators as to the influence of manure on attacks by *P. parasitica* led to this study.

Only slight differences in physiological characters were noted in the 11 single-spore isolates, but the differences in sexuality were more important (E. S. R., 73, p. 324). As indicated by the results with seedlings grown under sterile conditions in tubes containing various nutrient agar media and then inoculated, it appeared that the season of the year was more important than the nature of the nutrient solution used, light exerting a great influence on the green plants with respect to susceptibility. In other tests with seedling cabbages grown from seeds derived from variously manured plants and with heads (used as a whole or in the form of sterile pieces in tubes) from variously manured plants, no influence of the manure on susceptibility could be observed.

The fungus was able to attack chlorotic cotyledons and other parts of cabbage plants and green seedlings in the spring and fall, but green seedlings were attacked with difficulty or not at all in winter, even at the same temperatures. The spontaneous disease occurs on young seedlings, on old, withering leaves, and on stored cabbages. Inoculations on the related *Cheiranthus allioni* in tubes succeeded only on yellow or dying leaves.

The general conclusion from the study was that a special equilibrium of substances in the cells is necessary for successful attack. The most vigorously assimilating cells are not the most susceptible, and the condition of the chlorophyll is also an important factor. The type of manuring may play a secondary role, e. g., by inducing an earlier withering of the leaves. The conflicting results by others are explained by the supposition that factors other than the manure were concerned.

The method of survival of bacteria in the puparia of the seed-corn maggot (Hylemyia cilicrura Rond.), J. G. Leach (*Ztschr. Angew. Ent., 20 (1933), No. 1, pp. 150–161, figs. 9*).—In continuation of previous studies at the Minnesota Experiment Station on the seed-corn maggot and bacteria, with special reference to potato blackleg (E. S. R., 65, p. 360), the author by histological methods demonstrated the survival of bacteria in the lumen of the mid-intestine, in the cast-off linings of the fore- and hind-intestine, and in the space between the prepupal cuticle and the true pupa. In the last case the bacteria had apparently escaped from the hind-intestine into the space just outside the pupa and inside of the prepupal cuticle, where they adhered to the prepupal cuticle and multiplied slightly. In the mid-intestine during histolysis they decreased in number and lost their affinity for stains, so that for a time they could not readily be demonstrated, but they reappeared and multiplied rapidly before the imago emerged. The bacteria were not in a filtrable state during this period. There appeared to be a selective action on the bacteria surviving in the mid-intestine which was not operative on those surviving in the cast-off linings of the fore- and mid-intestine.

The leaf curl or crinkle of cotton in Italian Somaliland [trans. title], G. Russo (*Ist. Agr. Colon. Ital., Relaz. e Monog. Agr. Colon., No 37 (1935), pp. 43,* *figs. 14*).—From his studies of cotton leaf curl, the author excludes the action of a virus and of leaf hoppers (*Empoasca* spp.) or Aleyrodidae from any etiological relations and attributes the disease to physiological causes. The environmental relations and pathological histology were studied and are discussed.

Observations on the stigmatomycoses of cotton bolls in the Belgian Congo [trans. title], R. L. Steyaert (*Bul. Agr. Congo Belge, 25 (1934), No. 4, pp. 473–493, fig. 1*).—The author reviews the literature on the fungus internal boll rots of cotton, including a tabulation of the intermediate plant hosts, the fungi concerned and their insect vectors, and the geographical distribution. To this table he has added his observations in the Belgian Congo, including *Centrosema plumieri* as a new host plant for *Nematospora coryli*. Other Belgian Congo hosts observed for *Nematospora* spp. were *Phaseolus lunatus*, *P. vulgaris*, *Vigna sinensis*, *Soja hispida* (yellow and black seeded varieties), and *Coffea arabica*.

In order to determine the incidence of internal boll rots throughout the season, cotton plats in six groups were sown at six successive fortnightly intervals, beginning on July 10. Three types were distinguished as follows: Fungus internal boll rots (stigmatomycoses), red internal boll rot (presumably bacterial), and a bacterial boll rot somewhat resembling the fungus form. The fungus rot increases in importance the later the seeding. The other two are less injurious and less subject to seasonal variations.

Mosaic diseases of the cucumber, G. C. Ainsworth (*Ann. Appl. Biol., 22 (1935), No. 1, pp. 55–67, pls. 3, figs. 2*).—The author studied three cucumber mosaic viruses (green mottle mosaic or cucumber virus 3, yellow mosaic or cucumber virus 4, and yellow mottle mosaic or cucumber virus 1) occurring in England, and here describes them and the diseases which they induce. The first and second were not transmissible to solanaceous plants and are here described for the first time. Thus far no insect vectors are known. The first, on cucumber, caused a dark green mottle with blistering and distortion of the leaves, but the fruit was usually not marked. The second gave rise to a distinct type of leaf mottle, yellow to silver-white in color, and the fruit was also marked.

The third mosaic, characterized by a diffuse, yellow mottling of cucumber leaves and fruit, is transmissible to solanaceous plants. The symptoms induced in tomatoes (including fernleaf) and other hosts are described, and notes are given on the insect vectors.

Control measures for the cucumber mosaics are briefly discussed.

On the occurrence of Aplanobacter rathayi E. F. Smith on Dactylis glomerata in England, W. J. Dowson and M. d'Oliveira (*Ann. Appl. Biol., 22 (1935), No. 1, pp. 23–26, pl. 1*).—The occurrence of this bacteriosis is definitely recorded for the first time in Cambridgeshire, though it has probably been present unrecognized for some time and is being constantly introduced on imported Danish seed.

The disease is compared with a similar disease in Germany. In cultural and growth characters the isolates agreed exactly with descriptions of *A. rathayi*. Inoculations from pure cultures gave negative results, though the spontaneously occurring bacterial slime proved pathogenic.

A comparison of certain foreign and American potato viruses, K. Koch and J. Johnson (*Ann. Appl. Biol., 22 (1935), No. 1, pp. 37–54, pls. 3*).—With the reported occurrence of a considerable number of different potato viruses in various parts of the world, the need for comparative studies of the group becomes increasingly evident. In the present study at the University of Wisconsin, potato viruses from 9 other countries were compared with typical American forms, the chief emphasis being placed on the "mottle", "ring spot", and "vein-banding" potato viruses.

The first two viruses were found in potatoes from all the other countries, but only in about one-half of the 75 varieties or lots tested. These viruses thus appear to be more widespread in the standard American varieties than in those of other countries. The vein-banding virus was found in potatoes from 6 of the 9 other countries and was often free from associated viruses.

The viruses from widely different sources, when compared under the same conditions, were remarkably constant, but some variation occurred in certain cases as between the vein-banding virus and the "Y" virus from England, though these viruses are in most respects very similar. The possible relationships of certain other viruses are discussed, and a potato streak virus is described.

Incomplete or faulty descriptions and synonymy in nomenclature are believed to be largely responsible for the present confusion in the potato virus literature. More attention to the description of the viruses themselves is advised.

The relation between temperature and potato blight [trans. title], E. van Everdingen (*Tijdschr. Plantenziekten, 41 (1935), No. 6, pp. 125–133*).—This paper reviews the literature and presents local data on the *Phytophthora* blight in relation to temperature.

Prevention of blight (Phytophthora infestans) in seed potatoes, T. Small (*Ann. Appl. Biol., 22 (1935), No. 1, pp. 16–22*).—The losses of seed potatoes through blight in Jersey, Channel Islands, may be subdivided into losses in the field at digging time and in the seed boxes after harvesting. The results of this study indicate that the field losses may be prevented in most seasons by regular and thorough spraying with soda bordeaux mixture (4–1⅛–40), while those in the boxes may be reduced by scorching or removing the diseased haulms before digging or by immersing the tubers in a fungicide.

A new potato epidemic in Great Britain, R. N. Salaman and C. O'Connor (*Nature [London], 134 (1934), No. 3398, p. 932, figs. 2*).—An outbreak of early blight (*Alternaria solani*), rare in Great Britain, is reported.

A potato seed plat roguing experiment, F. C. Stewart (*New York State Sta. Bul. 655 (1935), pp. 10*).—After briefly reviewing the origin of the rogued seed plat and pointing out some of the sources of error in earlier experiments (E. S. R., 52, p. 548), the author describes an experiment carried out in northern New York.

Through the use of an isolated and carefully rogued seed plat a high grade of certified Green Mountain potatoes from fields of from 6 to 8 acres during 9 consecutive years was obtained. The experiment was begun in 1924 with seed containing 2.6 percent of virus diseases and ended with a report by the official inspector of only 0.4 percent in 1932.

The success is believed to have been due to the favorable location (with high temperatures rare and aphids not often plentiful on potatoes), to the earliness and thoroughness of roguing, and to the use of the tuber-unit method of planting in the seed plat. It is believed that by continuance of these methods the same high standard of health could be maintained indefinitely.

Report on the State test fields for plant culture relative to soil disinfection for Rhizoctonia and scab diseases of potatoes [trans. title], C. M. van der Slikke (*Tijdschr. Plantenziekten, 41 (1935), No. 3, pp. 65–73*).—The author reports favorable results with the use of corrosive sublimate.

Relative effects of calcium and acidity of the soil on the occurrence of potato scab, F. M. Blodgett and E. K. Cowan (*Amer. Potato Jour., 12 (1935), No. 10, pp. 265–274, figs. 2*).—Following a potato scab survey in New York State, previously reported (E. S. R., 71, p. 207), a number of preliminary greenhouse tests were undertaken at Cornell University to elucidate some of the influences other than pH on the occurrence of the disease and to check further on the relation of pH to scab under more uniform soil conditions.

The results of these tests gave no reason for believing that lime has any effect on scab other than through its influence on soil reaction. The general relation of acidity to scab was similar to that reported from the field survey, but in the present tests the amount was reduced by extremely heavy applications of lime, giving pH values of the soil higher (about pH 9.0) than those found on the survey (from pH 8.0 to 8.3) where scab was not troublesome.

The bacterial leaf-spot of sugar beet, E. Hirata (*Chosen Govt. Gen. Agr. Expt. Sta. Jour., No. 17 (1928), pp. 3+33, pls. 4; Eng. abs., p. 33*).—The author reports his study of this disease, which sometimes causes severe injury to sugar beets in Chosen, attacking the leaves, stems, bracts, and buds, and in some cases causing leaf spots and withering of the leaves. The morphology and cultural characters of the organism shown to be the cause led the author to consider it a strain of *Bacterium aptatum*. It survived in infected seeds and in beet tops left in the field, but readily lost its viability when buried in the soil. Successful inoculations were made in 23 hosts.

The first records of the mosaic disease of sugar-cane in Puerto Rico, G. N. Wolcott (*Jour. Agr. Univ. Puerto Rico [Col. Sta.], 19 (1935), No. 2, pp. 117–120, fig. 1*).—"The purpose of the present note is to place on record the first observations on the occurrence of mosaic disease of sugarcane in Puerto Rico and to supplement the statement of J. A. Stevenson, plant pathologist of the College Experiment Station at the time of its discovery here, as to its early distribution."

Root diseases of sugar cane in Puerto Rico, I, II, M. T. Cook (*Jour. Agr. Univ. Puerto Rico [Col. Sta.], 19 (1935), No. 2, pp. 121–128, pls. 8*).—Two papers are presented.

I. *Normal structure of roots.*—This constitutes a brief review of present knowledge of the structure of normal, healthy roots of sugarcane.

II. *A new parasitic fungus in the roots of sugar cane.*—The fungus here discussed was found in the roots of sugarcane growing in pots, and a large number of the diseased roots were placed in killing fluid for the present study based on sectioned and stained material. The disease symptoms consisted of small, reddish spots. The fungus was restricted to the younger parts of the roots, and as a result of this study it is placed tentatively in the genus *Olpidium* and described as *O. sacchari* n. sp.

Tobacco diseases and decays, F. A. Wolf (*Durham, N. C.: Duke Univ. Press, 1935, pp. XIX+454, figs. [113]*.)—The prime purpose of this volume is stated as to aid growers in the identification of tobacco diseases and to inform them regarding the causes and control of each disorder treated. It will also provide information to all others interested in the tobacco industry, including manufacturers, investigators, phytopathologists, agricultural advisers, and students.

The subject matter of the text is grouped around the following topics: The seedbed as related to tobacco disease control, nutritional diseases, those due to water relations, and disorders and diseases that are little known and noninfectious; diseases due to viruses, to bacteria, to fungi, to nematodes, and to parasitic phanerogams; and decays of tobacco during curing, fermentation, and storage, and after manufacture. References are given at the end of sections and chapters, and a 51-page general bibliography and an index complete the volume.

Downy mildew (blue mould) of tobacco: Its control by benzol and toluol vapours in covered seed-beds, H. R. Angell, A. V. Hill, and J. M.

Allan (*Jour. Council Sci. and Indus. Res.* [*Aust.*], *8* (*1935*), *No. 3, pp. 203–213*).—In several small-scale tests during the period from mid-November 1934 to early June 1935, including three experiments in covered seedbeds and one confirmatory test in commercial seedbeds, the occurrence of infection by *Peronospora tabacina* on tobacco seedlings was prevented, despite thorough inoculation, by the concentration of benzol vapor produced by a surface area of fluid equal to, or more than, 2 sq. in. per square foot of bed. Toluol vapor was almost equally effective. Lower concentrations of these vapors controlled the spread of downy mildew. The results are promising, but experiments under spring conditions are necessary before recommendations can be made as to commercial use.

Downy mildew of tobacco on tomato, eggplant, and pepper, A. V. Hill (*Jour. Aust. Inst. Agr. Sci.*, *1* (*1935*), *No. 2, p. 81*).—Tests apparently indicated that at present these host plants are of no importance in Australia, but the occurrence of downy mildew on pepper seedlings under special conditions led to the inference that tomato and eggplant also may be susceptible under exceptional circumstances. The possible difference in host range is believed insufficient to justify the view that this tobacco disease is caused by different species of *Peronospora* in America and Australia.

Two viruses of the cucumber mosaic group on tobacco, I. A. Hoggan (*Ann. Appl. Biol.*, *22* (*1935*), *No. 1, pp. 27–36, pl. 1*).—As a result of this study at the Wisconsin Experiment Station in cooperation with the U. S. D. A. Bureau of Plant Industry, the author discribes a "yellow cucumber mosaic virus" which appeared to develop spontaneously during experiments with ordinary cucumber mosaic in tobacco. It is readily distinguishable by the conspicuous, bright yellow mottling of the leaves. Since the modes of transmission, properties, and host range of the virus are apparently identical with those of the ordinary cucumber mosaic virus, it is regarded as a variant strain.

A "cucumber mild mosaic virus" in tobacco is also described which seems to belong to the same general group, though differing more from the ordinary cucumber mosaic virus. It is characterized mainly by the milder symptoms induced and by its lower thermal death point, tolerance to dilution, and longevity in vitro.

These data offer additional evidence of strain variation in the cucumber mosaic group, such as has already been recognized in certain other plant virus groups.

Observations on a nematode disease of yams, T. Goodey (*Jour. Helminthol.*, *13* (*1935*), *No. 3, pp. 173–190, pl. 1, figs. 12*).—The author reports yam tubers from Nigeria as infested with nematodes and gives the detailed results of his study of the morphology, life history, and systematics of the organism, which he names *Anguillulina bradys* n. comb. The symptoms induced are apparently confined to the tubers in the form of yellowish, and later brown or black, areas under the skin. The histopathology is described and figured. The species of yams thus far known to be attacked in Nigeria are *Dioscorea alata*, *D. cayenensis*, and *D. rotundata*. The nematode has been reported also from Jamaica and Puerto Rico.

Brown rot of fruits and associated diseases of deciduous fruit trees.—I, Historical review and critical remarks concerning taxonomy and nomenclature of the causal organisms, T. H. Harrison (*Roy. Soc. N. S. Wales, Jour. and Proc.*, *67* (*1933*), *pp. 132–177*).—In this historical review an attempt is made to assess the status of the various combinations used for these organisms in terms of the standards set by the International Rules for Botanical Nomenclature.

Evidence is presented as showing that *Sclerotinia fructicola* is the correct name for the American brown rot fungus. The apricot *Monilia* of Europe is regarded as cospecific with the fungus known as "*S. cinerea*", but the correct name is considered to be *S. laxa*. *S. fructigena* Ader. and Ruhl. is retained for the fungus whose imperfect stage causes fruit rot of both pome and stone fruits and produces pustules which are usually prominent, ochraceous to buff colored, and dome shaped. It is this fungus which has previously been referred to as *S. fructigena* (Pers.) Schröt.

It is considered inadvisable to continue the form names *cerasi*, *avium*, and *pruni* in connection with the fungus previously called *S. cinerea*, but the combination *S. laxa* f. *mali* is used.

For reasons given, the above species are retained for the present in the genus *Sclerotinia*. However, if the genus should later be split up, it is believed that the available evidence indicates that the fruit-rotting species should be listed under the genus *Stromatinia* rather than under *Monilinia*.

Occurrence in Australia of Lambertella corni-maris von Hohnel, a brown spored parasitic Discomycete, T. H. Harrison (*Jour. Aust. Inst. Agr. Sci., 1 (1935), No. 2, p. 76*).—This note reports the finding of apothecia of *L. corni-maris* on mummied apricot fruits in New South Wales. They have now been found also on Cornelian cherry (*Cornus mas*), apple, and pear mummies. The possibility is suggested that *L. corni-maris* may be synonymous with *Sclerotinia phaeospora*, a serious apple pathogen in Japan.

Progress report on the investigation of corky-pit of apples, J. D. Atkinson (*New Zeal. Jour. Sci. and Technol., 16 (1935), No. 5, pp. 316-319*).—The author provisionally applies the name "corky pit" to a disease known locally under a variety of names (poverty pit, cork, corky core, brown heart, crinkle, drought spot, and bitter pit), but which in the present state of knowledge he does not definitely associate with similar diseases reported in Australia and America.

In the spring of 1934 field studies were initiated. These included a series of experiments in which salts of 16 elements were introduced from reservoirs into holes bored into the trunks of three varieties of apple trees. The fruits from the trees treated with boric acid either remained free or showed not more than 3 percent of corky pit, while those from the other treatments and the controls were severely affected. Apparently corky pit is materially influenced by the addition of boron.

Differences in the seasonal development of apple scab in Iowa in 1933 and 1934, G. L. McNew (*Iowa State Hort. Soc. Rpt., 69 (1934), pp. 78-82, fig. 1*).—In this preliminary report from the Iowa Experiment Station, the author states that apple scab (*Venturia inaequalis*) was severe in western Iowa in 1932, moderate in 1933, and absent in 1934. In 1934 the season was more advanced than in 1933, the apples blooming 7 days earlier and the fungus maturing 17 days earlier. Furthermore, the fungus was ready to infect at any time after the leaves emerged in 1934, but the absence of rain from April 9 to May 12 prevented a severe infestation. Although the cluster bud spray was timely in 1933, it proved too late in 1934. It is thus evident that the spraying dates should be based on the development of the scab fungus rather than on that of the tree.

In 1934 the scab fungus matured a week earlier in western than in eastern Iowa, indicating that a generalized spray schedule for the State may not be advisable.

Alterations in the fruits of Citrus sinensis caused by Phoma aurantiiperda n. sp. and by Septoria citricola n. sp. [trans. title], G. Ruggieri (*Bol. R. Staz. Patol. Veg. [Roma], n. ser., 15 (1935), No. 2, pp. 313-322, fig. 7*).—The author describes an internal disorganization and characteristic sunken spots in the navel region of mature oranges due to *P. aurantiiperda*, and an internal decay and superficial brown spots, also on mature oranges, due to *S. citricola*.

Alterations in Citrus sinensis caused by Mycosphaerella aurantiorum n. sp. [trans. title], G. Ruggieri (*Bol. R. Staz. Patol. Veg.* [*Roma*], *n. ser.*, *15* (*1935*), *No. 2*, *pp. 338–346*, *figs. 8*).—The author describes leaf and fruit spots of orange shown to be due to the pycnidial stage (*Septoria aurantiorum* n. sp.) of *M. aurantiorum*, the latter stage having been developed in culture.

Spraying for the control of citrus scab, G. D. Ruehle (*Citrus Indus.*, *16* (*1935*), *No. 5*, *pp. 8, 9, 17, 18*).—This paper from the Citrus Experiment Station, Lake Alfred, Fla., reports the results of experiments conducted during 1932, 1933, and 1934 as indicating that citrus scab [*Sporotrichum citri*] usually can be controlled effectively and economically by spraying. The copper sprays consistently gave a better control than the sulfur or mercury preparations, and of the copper sprays home-made bordeaux mixture appeared best. Two applications of bordeaux mixture with a suitable spreader are recommended where severe infection is anticipated, the first (3–3–50) to be given just before the spring growth starts and the second (1.5–1.5–50) during the last of the blooming stage. Without further treatment, beneficial results were noted in the season following such applications. Commercial control in the second season was obtained by the dormant spray alone, which was also efficient for mild infections of trees not sprayed the preceding season.

The results with the other spray materials and with combinations for insect control are briefly discussed.

A new form of gummosis and intumescence of orange leaves [trans. title], G. Ruggieri (*Bol. R. Staz. Patol. Veg.* [*Roma*], *n. ser.*, *15* (*1935*), *No. 2*, *pp. 347–354*, *figs. 6*).—The author studied and here describes the gross symptoms and histopathology of an apparently new form of gummosis and intumescence of obscure origin. Various etiological possibilities are discussed, and all direct causes of parasitic nature appear to be excluded.

A new disease of dates [trans. title], A. Alfieri (*Bul. Soc. Roy. Ent. Égypte*, *27* (*1934*), *No. 4*, *pp. 445–448*, *figs. 5*).—A disease of date palms in the oasis of Siwa in the Libyan desert proved to be due to the secretion of a uniform, white, saccharin layer by the young larvae of *Ommatissus binotatus libyous* on the lower side of the leaves. Asphyxiation of the host tissues was thus probably due to the development of fungi and the adherence of dust to this layer. The period of attack was from May to the end of September.—(*Courtesy Biol. Abs.*)

Boxwood diseases in Virginia, J. G. Harrar (*Va. Fruit*, *23* (*1935*), *No. 10*, *pp. 14, 15*).—This contribution from the Virginia Polytechnic Institute presents briefly the present status of boxwood diseases in Virginia, serious diseases having thus far been reported from 25 counties.

The Dutch elm disease, R. P. White (*N. J. Agr.*, *17* (*1935*), *No. 6*, *p. 4*).—This report from the New Jersey Experiment Stations is a brief, semipopular account of the methods and progress in the control of this disease.

Investigations of the elm disease at the entomological laboratory, Wageningen, in 1934 [trans. title], J. J. Fransen (*Tijdschr. Plantenziekten*, *41* (*1935*), *No. 9*, *pp. 240–260*).—This is a summary of investigations of insects as vectors of the Dutch elm disease fungus [*Ceratostomella* (*Graphium*) *ulmi*] and of their control, including studies as to the preference of elm bark beetles (*Scolytus scolytus* and *S. multistriatus*) for certain individual trees and for varieties and species of elms resistant or comparatively resistant to the fungus.

Report of the investigations of the elm disease carried out at the Phytopathological Laboratory "Willie Commelin Scholten", Baarn,

during 1934 [trans. title], C. BUISMAN (*Tijdschr. Plantenziekten, 41 (1935), No. 5, pp. 104–120, pls. 4*).—This paper summarizes the work of this organization during 1934 relative to the incidence of the Dutch elm disease in the Netherlands and in other countries, to infection tests with European and Asiatic species of elms, and to studies of the anatomy of the wood of trees infected with [*Ceratostomella* (*Graphium*) *ulmi*].

Infection tests on different species of elms with the aid of elm bark beetles [trans. title], J. J. FRANSEN and C. BUISMAN (*Tijdschr. Plantenziekten, 41 (1935), No. 9, pp. 221–239, pl. 1*).—This paper reports the results of tests on the transmission of the Dutch elm disease fungus [*Ceratostomella* (*Graphium*) *ulmi*] to nine species or varieties of *Ulmus* by the large elm bark beetle (*Scolytus scolytus*) and the smaller elm bark beetle (*S. multistriatus*).

Physiology of pines infested with bark beetles, R. W. CAIRD (*Bot. Gaz., 96 (1935), No. 4, pp. 709–733, figs. 11*).—From moisture analyses of *Pinus echinata* infested with *Dendroctonus frontalis*, made after the trees had been in a dye solution, it was found that drying of the wood took place from the outer ring to the center in the region opened by the galleries. Loss of ability to conduct solutions was associated with drying of the wood, the accumulation of air in the tracheids being suggested as the cause.

Penetration of fungi into the wood was determined at 1-in. intervals up the trunks of trees infested with *D. frontalis*. *Ceratostomella pini* (blue stain) and an unidentified fungus were the only fungi isolated consistently from the interior of trees in the early stages of infestation. Their positions were closely associated with the stoppage of conduction and drying of the wood. The fungi may accelerate the drying, since drying and stoppage of conduction similar to that in trees infested by bark beetles occurred in trees inoculated with *C. pini*. The study of trees infested with the beetles, taken with the fungus inoculations, indicated that the death of a tree is due to the same fundamental causes in both cases.—(*Courtesy Biol. Abs.*)

Annual report: Pathological division, F. BEELEY (*Rubber Res. Inst. Malaya, Ann. Rpt., 1934, pp. 95–115, figs. 2*).—Progress reports on the following studies relative to *Hevea* are included in this report: The effects of environmental conditions on the incidence and virulence of such diseases as moldy rot, *Oidium* leaf mildew, and *Phytophthora* diseases; root diseases (*Fomes lignosus*, *F. noxius*, *Ganoderma pseudoferreum*, and *Ustulina zonata*); diseases of the tapping panel (moldy rot due to *Ceratostomella fimbriatum*, and sun scorch); branch disease (*Corticium salmonicolor*); leaf mildew (*O. heveae*); insect and animal pests, including white ants (*Coptotermes curvignathus*), cockchafer grubs (*Psilopholis grandis*), snails, and rodents; and the bacteriology of latex.

Oidium leaf disease in Ceylon in 1935, R. K. S. MURRAY (*Ceylon Rubber Res. Scheme, Quart. Circ., 12 (1935), No. 1–2, pp. 1–9*).—The author records data on the incidence of *O.* [*heveae*] on rubber trees in Ceylon and on the benefits from sulfur dusting, which gave almost absence of the spotted, distorted, undersized leaves so characteristic of badly affected areas. Dusting is recommended as a definite policy for the more severely affected low country localities, in spite of the fact that the less the incidence of *Oidium* the greater is the likelihood of damage by *Phytophthora*, which depends on the existence of the pods for its main center of infection. Fertilizer applications were shown to be of no value in checking the *Oidium*.

The control of Oidium, R. K. S. MURRAY (*Ceylon Rubber Res. Scheme, Quart. Circ., 12 (1935), No. 1–2, pp. 10–17*).—This is a popular lecture giving the details of methods for the control of the *Oidium* disease of *Hevea* rubber trees.

Demonstration of the control of Oidium on small holdings in 1935, W. I. Pieris (*Ceylon Rubber Res. Scheme, Quart. Circ., 12 (1935), No. 1–2, pp. 18–24*).—Beneficial effects are reported from sulfur dusting against *O. heveae* on *Hevea* rubber trees.

Wood staining due to parasites in Italy [trans. title], G. Goidànich (*Bol. R. Staz. Patol. Veg. [Roma], n. ser., 15 (1935), No. 2, pp. 363–388, fig. 1*).—This is a general review of present knowledge on timber stains and wood-staining fungi, with particular reference to Italian conditions. A bibliography of 55 titles is appended.

A key to the genera of free-living nemas, N. A. Cobb (*Helminthol. Soc. Wash. Proc., 2 (1935), No. 1, pp. 1–40*).—This key, built up and used by the author as a card catalog during 40 yr. of work in nematology, had been reorganized in rough manuscript form during the last 2 yr. of his life (E. S. R., 67, p. 352) and is here presented as checked, revised, and prepared for the press by M. V. Cobb and C. Cooper. In addition to the key there is a glossary, a six-page literature list, and an index.

Opuscula miscellanea nematologica, I, II, G. Steiner (*Helminthol. Soc. Wash. Proc., 2 (1935), Nos. 1, pp. 41–45, figs. 3; 2, pp. 104–110, figs. 4*).—The first of these papers includes notes on and descriptions of *Anguillulina gallica* n. sp. living in burls of an elm and believed to feed on fungi; *Acrobeles glaphyrus* n. sp. from a diseased tuber of *Polyanthes tuberosa* from Mexico, *Cephalobus maximus* n. sp., amend., including a description of the hitherto unreported male from *Iris xiphioides* from California; and studies of a nematode from *Brassica campestris*, leading the author to regard *Anguillulina cancellata* as a synonym of *A. costata*.

The second paper includes notes and descriptions of new nematodes in diseased potatoes from Cuba (*Aphelenchoides solani* and *Cephalobus cubaënsis* n. spp.); a description of *A. hunti* n. sp. parasitic in tiger lily bulbs (*Lilium tigrinum*) from Japan and in fruits of the tomatillo (*Physalis ixocarpa*) from Mexico; notes and descriptions of nematodes from a bulb of *Sternbergia lutea* from Palestine, including a species of *Rhabditis*, *Neocephalobus compsus* n. sp., *Panagrolaimus heterocheilus* n. sp., and *Cephalobus symmetricus* (emended description); and a taxonomic note on the genus *Parasitaphelenchus*, with diagnosis restricting it to forms resembling *P. uncinatus*.

Notes on free-living and plant-parasitic nematodes, I, II, G. Thorne (*Helminthol. Soc. Wash. Proc., 2 (1935), Nos. 1, pp. 46, 47; 2, pp. 96–98*).—The first of these papers comprises brief notes on the occurrence of *Diphtherophora perplexans*, the effect on nematodes of copper sulfate used in snail control, and the placing of *Tylenchorhynchus cylindricus* as a synonym of *Anguillulina dubia*. The second paper consists of notes on the taxonomy of the superfamily Dorylaimoidea, the probable identity of *Hoplolaimus coronatus* with *Nemonchus galeatus*, the effect of ammonium thiocyanate on the sugar beet nematode (*Heterodera schachtii*), and on a new slide-ringing material consisting of two parts nitrocellulose solution and one part ADM–100 (a linseed-oil product used in the paint trade).

Some remarks about the nematodes Cephalobus contractus (Cephalobidae) and Diplogaster aerivora (Diplogasteridae) G. Steiner (*Helminthol. Soc. Wash. Proc., 1 (1934), No. 2, pp. 56–58, fig. 1*).—In a diseased celeriac root (*Celeri graveolens rapaceum*) from Sweden, found in ship's stores at Baltimore, Md., four nematodes were observed, including the two species named in the title. *C. contractus* was also observed in a strawberry bud from Riverhead, N. Y. Both lots of specimens differed from the type description. *D. aerivora* has not been recorded hitherto outside the United States. Both species are here described and figured.

The influence of a number of factors upon the activation of dormant or quiescent bulb nematodes, Anguillulina dipsaci (Kuhn, 1858) Gerv. and v. Ben., 1859 (Anguillulinidae), R. J. Hastings and W. Newton (*Helminthol. Soc. Wash. Proc., 1 (1934), No. 2, pp. 52–54*).—To evaluate the effects of hot water and other treatments against the bulb nematode, it is essential to distinguish between death and dormancy. Evidence is presented that the amount of surface exposed to the air is of importance in the induction of motility, as shown by the fact that recovery progressively decreased with the depth of the solution in which dormant preadults were suspended. Suspension in an infusion of rotten bulb tissue markedly inhibited recovery of motility, but less so when the suspensions were placed in shallow dishes. In an atmosphere of carbon dioxide recovery of motility was nil, and this gas also appeared to injure the nematodes. But little evidence was obtained that prolonged contact with an infusion of rotten bulbs had a similar injurious effect.

Gooseberry plants and lilies attacked by the strawberry nematode, Aphelenchoides fragariae (Anguillulinidae), G. Steiner (*Helminthol. Soc. Wash. Proc., 1 (1934), No. 2, pp. 58, 59, fig. 1*).—The author reports infestations of gooseberry plants and lilies (*Lilium philippinense formosanum grandiflora*) from California with *A. fragariae.* Detailed descriptions of the two sets of nematode specimens are given, and from this study *A. ribes* is considered a synonym of *A. fragariae.*

Aphelenchoides fragariae (Nematoda: Anguillulinidae) infesting begonias in the Pacific Northwest, W. D. Courtney and H. J. Reynolds (*Helminthol. Soc. Wash. Proc., 1 (1934), No. 2, pp. 59–61, figs. 2*).—The disease here reported and described appears first as rusty brown spots between the leaf veins, which later coalesce and turn dark brown, the leaf margins becoming dry and brittle.—(*Courtesy Biol. Abs.*)

Water temperatures lethal to begonia, chrysanthemum, and strawberry "strains" of the nematode Aphelenchoides fragariae (Anguillulinidae), J. R. Christie and L. Crossman (*Helminthol. Soc. Wash. Proc., 2 (1935), No. 2, pp. 98–103, figs. 2*).—In preliminary tests with infested North Carolina-grown strawberry plants, a few nematodes survived hot water treatment at 47.8° C. (118° F.) for 30 and 45 min., but all were apparently killed in 55 min. Further tests with nematodes removed from the host plants, using various temperatures and durations of treatment, indicated marked differences in the ability of different strains to survive, and the results strongly suggest the existence of physiological "races" or strains. This theory would explain the difference in seasonal behavior of infested strawberry plants in Massachusetts and in the southern United States.

Aphelenchoides hodsoni n. sp., a nematode affecting Narcissus bulbs and leaves, T. Goodey (*Jour. Helminthol., 13 (1935), No. 3, pp. 167–172, figs. 6*).—The author describes *A. hodsoni* n. sp., causing grayish, decayed areas in infested bulbs and premature yellowing of the leaves. The latter may become dwarfed and are sometimes split.

The control of the root-knot nematode, Heterodera marioni (Cornu) (Anguillulinidae), on tuberoses by hot water and vapor heat, G. W. Sherman (*Helminthol. Soc. Wash. Proc., 2 (1935), No. 2, p. 111*).—Hot water treatment at 110°, 112°, and 114° F. for 1 hr. failed to kill all nematodes, but none were found in tubers treated at 116° for 1 hr. or at 118° and above for 30 min. In the vapor-heat tests living nematodes were found in all lots treated with temperatures up to and including 122° for 30 min., and only the lot treated at 124° remained entirely free. No apparent injury to the plants occurred in any of these tests.

The nematode Neotylenchus abulbosus Steiner (Anguillulinidae) as a parasite of sugar-beets, G. Thorne and C. Price (*Helminthol. Soc. Wash. Proc., 2 (1935), No 1, p. 46, figs. 2*).—This is a note on serious infestation at Chino, Calif.

Procephalobus mycophilus n. g., n. sp. (Cephalobidae), a nematode living in the sclerotia of the fungus Balansia claviceps, G. Steiner (*Helminthol. Soc. Wash. Proc., 1 (1934), No. 2, pp. 54–56, fig. 1*).—Descriptions are given of this new genus and species of nematode found infesting the sclerotia of *B. claviceps*, which parasitizes *Cenchrus echinatus* and various other grasses of Mexico, Florida, and the West Indies. Observations also seem to indicate that the nematode may distribute the fungus spores.

ECONOMIC ZOOLOGY—ENTOMOLOGY

[Contributions on wildlife research] (*U. S. Dept. Agr., Bur. Biol. Surv., 1935, BS–1, pp. 3; BS–2, pp. 5; Wildlife Res. and Mangt. Leaflets BS–3, pp. 7; BS–4, rev., pp. 6; BS–5, pp. 3; BS–6, pp. 9; BS–7, p. 1; BS–8, pp. 4; BS–9, pp. 4; BS–10, pp. 2; BS–11, pp. 4; BS–12, pp. 4, fig. 1; BS–13, pp. 7; BS–14, pp. 2; BS–15, pp. 2; BS–16, pp. 7, pl. 1; BS–17, pp. 22; BS–18, pp. 4; BS–19, pp. 11; BS–20, pp. 7, figs. 2; BS–21, pp. 3; BS–22, pp. 4; BS–23, pp. 29; BS–24, pp. 4*).—These contributions on wildlife, issued in mimeographed form, are respectively as follows: Winter Food of Ruffed Grouse in New York, by L. H. Kelso; Aids for Bird Students; The Present Situation regarding Eelgrass (*Zostera marina*), by C. Cottam; Available Publications of the Bureau of Biological Survey; Tularemia, an Animal-Borne Disease, by W. B. Bell and J. E. Shillinger; Publications on Cage Birds; Instructions for Controlling Bats; Publications on Attracting Birds; Infectious Diseases as a Cause of Loss in Wildlife, by J. E. Shillinger; The Possibility of Secondary Poisoning from Thallium Used in the Control of Rodents, by F. E. Garlough; Birds Aid Blueberry and Cranberry Growers, by P. Knappen; The Present Plight of the Jackson Hole Elk, by H. P. Sheldon, O. J. Murie, and W. E. Crouch; Protecting Grain Crops from Damage by Wild Fowl, by E. R. Kalmbach; Planting for Wildlife in the Corn Belt and Planting for Wildlife in the Cotton Belt, both by W. L. McAtee; Bird Refuges and Big-Game Preserves Administered by the Bureau of Biological Survey; Wildlife of the Atlantic Coast Salt Marshes, by W. L. McAtee; Federal Regulations on Hunting Waterfowl Explained; Plants Valuable for Wildlife Utilization and for Erosion Control, by W. L. McAtee; What Shall We Feed Our Pelters? by C. F. Bassett; Feed Cost of Producing Young Rabbits to Weaning Age and Feed Requirements in Raising Weaned Rabbits to a Weight of 6 Pounds, both by C. E. Kellogg; and Abstract of Fur Laws, 1935–36 (see below), and Bounties Paid by States, both compiled by F. G. Grimes.

Abstract of fur laws, 1934–35 (*U. S. Dept. Agr., Bur. Biol. Surv., 1934, Oct., pp. 31*).—This is a continuation of the annual abstract of fur laws (E. S. R., 70, p. 801), presented in mimeographed form. Appended to the abstract is a summary of the bounty laws in the various States.

The nidification of birds of the Indian Empire, III, IV, E. C. Stuart Baker (*London: Taylor & Francis, 1934, vol. 3, pp. VII+568, pls. 8; 1935, vol. 4, pp. XI+546, pls. 7*).—Volume 3 of this work (E. S. R., 70, p. 60) deals with birds from the family Ploceidae to Asionidae, and volume 4, which completes the work, from Pandionidae to Podicipidae.

Measuring the efficiency of materials used for snail control, A. J. Basinger (*Jour. Econ. Ent., 28 (1935), No. 6, pp. 903–905*).—Reference is made to work at the California Citrus Experiment Station in which a new commercial preparation, measured against a so-called "standard control" (obtained from the use of a poisoned bran bait), killed 59.83 percent of *Helix aspersa* Müller, as compared with 92.86 percent by the latter. The poison bran mash consisting of 1 lb. of calcium arsenate to 16 lb. of coarse wheat bran tested against *H. pisana* Müller on a small garden plat killed 92.46 percent of all snails present and 95.57 percent of all active snails. Tested against *H. aspersa* in an infested orange grove, it killed 87.68 percent of all snails present and 97.93 percent of all active snails.

Considerations of the value of field plot technique studies for entomologists, G. F. MacLeod (*Jour. Econ. Ent., 28 (1935), No. 6, pp. 1058–1061, fig. 1*).—A general discussion of the subject.

The rôle of biotic factors in the determination of population densities, H. S. Smith (*Jour. Econ. Ent., 28 (1935), No. 6, pp. 873–898, figs. 5*).—Contributing from the California Citrus Experiment Station, the author deals with the subject under the headings of population fluctuations and the principle of equilibrium, the meaning of the logistic curve, the effect of the environment as a unit, and the composition of environmental resistance.

Effect of host density on parasitism, S. E. Flanders (*Jour. Econ. Ent., 28 (1935), No. 6, pp. 898–900*).—This contribution from the California Citrus Experiment Station is limited to a description of the technic employed and a summary of the facts to be derived from the limited data.

Atlas of insects and related arthropods, J. Arias (*Atlas de insectos, ciempies y arañas. Barcelona: C. Scither, 1934, 5. ed., pp. 31, pls. 12*).—A popular atlas of insects and related arthropods, illustrated by 12 infolded colored plates.

[Notes on economic insects and their control] (*Jour. Econ. Ent., 28 (1935), No. 6, pp. 1072–1078, fig. 1*).—The contributions presented (E. S. R., 74, p. 227) are as follows: Attraction of Bait Used in Japanese Beetle Traps Increased by the Addition of Phenyl Ethyl Alcohol, by F. W. Metzger (p. 1072); New Host Plants of the Potato Leafhopper (*Empoasca fabae* (Harris)) and Their Probable Significance, by F. W. Poos (pp. 1072, 1073); Simuliids Annoy Livestock, by G. F. Knowlton (p. 1073), contributed from the Utah Experiment Station; A Simplified Roach Trap, by N. Tischler (pp. 1073, 1074); Pyrocatechin as a Protecting Agent for the Active Principles of Pyrethrum in Finished Fly-Sprays and Concentrates, by D. G. Hoyer and A. Weed (pp. 1074, 1075); Apple Trees Affected by Frequent Sprays of Summer Oil, by W. S. Hough (p. 1075), contributed from the Virginia Experiment Station; An Improved Codling Moth Trap, by L. F. Steiner (pp. 1075, 1076); and The Effectiveness of Various Derris and Cube Products for Control of the [Common] Red Spider on Greenhouse Plants, by H. H. Richardson (pp. 1076–1078).

[Report of work in entomology by the Illinois Station] (*Illinois Sta. Rpt. 1934, pp. 137–162, 224, figs. 2*).—Work under way during the year (E. S. R., 70, p. 648) by W. P. Flint, W. P. Hayes, G. H. Dungan, J. H. Bigger, M. D. Farrar, J. R. Holbert, S. C. Chandler, L. H. Shropshire, R. H. Painter, E. R. McGovran, C. C. Compton, J. P. McCollum, W. E. McCauley, W. A. Foster, A. S. Colby, and R. S. Marsh is noted as follows: Development of strains of corn resistant to the European corn borer damage; rotation of corn prevents corn rootworm injury; varietal resistance lessens chinch bug damage to corn; preference of chinch bugs for barley as an early breeding ground; delay in crop stabilization due to corn earworm damage; new materials tested for control of stored grain insects; progress of crop pest surveys in the protection of alfalfa, soybeans, and cotton from damage; hessian fly studies; sunflower weevil control; importance of treatment for peach borers at least every other fall during a series of poor peach crop years; importance of curculio surveys in the prevention of unnecessary expense by peach growers; value of oriental fruit moth studies to peach growers; liberation of the larval parasite *Macrocentrus ancylivorus* in combating the oriental fruit moth; value of oil dusts for peach insect control; improvement by oil emulsion of sprays used against the codling moth; value of San Jose scale surveys; thrips not the cause of blighting strawberry blooms; the crown borer as a serious enemy of Illinois strawberries; prevention of unnecessary expense in the control of onion maggot; control of gladiolus thrips by fumigation of overwintering corms with naphthalene flakes or hydrocyanic acid gas or by soaking in corrosive sublimate solution; control of leaf tiers by the use of green-dyed arsenicals; development of means of controlling mushroom springtails; destruction of the Mexican mealybug and citrus mealybug by hydrocyanic acid gas; effective means for the destruction of red spiders; prevention of privet thrips (*Dendrothrips ornatus* (Jab.)) damage by the use of nicotine sulfate; protection of lawns against insect pests by the use of lead arsenate; naphthalene as a means of controlling fleas in basements; simpler methods of ant control; and the importance of the control of red mite on black raspberry and of the grape berry moth.

Insect pest control (*Wisconsin Sta. Bul. 430 (1935), pp. 3–14, figs. 6*).—The work of the year referred to (E. S. R., 72, p. 501) relates to a new method of removing spray residues by the use of sodium silicate which shows promise, by C. L. Fluke, E. P. Dunn, and P. O. Ritcher; whey as a valuable ingredient in grasshopper bait, by H. F. Wilson; encouraging results obtained in spraying oak trees to reduce white grubs, by Fluke and Ritcher; the control of squash vine borers by a properly timed spray program, by T. C. Allen; lime-sulfur protection of apple trees from casebearers, by J. H. Lilly and Fluke; and three insects that menace southwestern Wisconsin apple orchards, namely, the codling moth, apple maggot, and apple curculio, by Ritcher and Fluke.

Report on entomological section for year ending March 31st, 1935, R. W. E. Tucker (*Agr. Jour.* [*Barbados*], *4* (*1935*), *No. 2, pp. 62–65*).—The work in entomology (E. S. R., 72, p. 655), briefly reviewed, relates to the introduction of the tachinid parasite *Lixophaga diatraeae* from Antigua and its mass breeding and liberation for control of the sugarcane borer in Barbados, and the large-scale introduction of the predacious larvae of *Pyrophorus luminosus* from Puerto Rico, where it is known as "cucubano", for control of the brown hardback *Lachnosterna* (*Phytalus*) *smithi*. Brief mention is made of the pests of tomato and work with the West Indian sweetpotato weevil.

Control of insect pests (*St. Lucia Agr. Dept. Rpt., 1934, pp. 10, 11*).—The work of the year briefly referred to relates to that with the small moth borers of sugarcane (the sugarcane borer and *Diatraea canella*) and with white root grubs of citrus.

[Studies of economic insects in India] (*Indian Forest Rec., n. ser., 1 (1935), Nos. 1, pp. 33, pls. 4; 2, pp. [3]+35–71, pls. 2; 3, pp. [3]+73–78, figs. 2, Eng. abs.; 4, pp. 79–93, pls. 2*).—The contributions presented are as follows: Immature Stages of Indian Coleoptera—16, Scarabaeoidea, by J. C. M. Gardner (E. S. R., 72, p. 511); On the Biology of the Psyllidae (Homopt.), by R. N. Mathur, with a note by C. F. C. Beeson; New Species of Brenthidae and Lycidae from India, by R. Kleine; and Immature Stages of Indian Coleoptera—17, Eucnemidae, by J. C. M. Gardner.

List of publications on Indian entomology, 1933 (*Imp. Council Agr. Res.* [*India*], *Misc. Bul. 5* (*1935*), *pp. 29*).—This list of publications on Indian entomology for 1933 is in continuation of lists for earlier years (E. S. R., 72, p. 655).

Report on the work of the entomological division, 1934, F. P. Jepson (*[Ceylon] Dir. Agr., Admin. Rpt., 1934, pt. 4, Ed., Sci., and Art (D), pp. 132–147*).—The occurrence of and work during the year (E. S. R., 72, p. 808) with insect enemies of tea, coconut and other palms, rubber, paddy and other grains, fruits, vegetables, tobacco, ornamental garden plants, etc., in Ceylon are reported upon.

Cyanide fumigation of mushroom houses, A. C. Davis and H. V. Claborn (*U. S. Dept. Agr. Circ. 364 (1935), pp. 10, figs. 3*).—It was found in the fumigation of commercial mushroom houses that "when chemically equivalent dosages of calcium cyanide, sodium cyanide with acid (1–1.5–2), and liquid hydrocyanic acid (1 lb. calcium cyanide, 0.5 lb. sodium cyanide, and 0.25 lb. hydrocyanic acid per 1,000 cu. ft. of air space) were used, the last two were much superior to calcium cyanide in the concentration of gas obtained.

"Liquid hydrocyanic acid gave a slightly higher maximum concentration of gas than sodium cyanide and acid. From the standpoint of safety, if properly handled, there is little choice between the two.

"The average results from tests made in a fumigating chamber show that mushroom insects and mites in a temperature brought from 75° or 80° to 100° F. in from 6 to 8 hr., held at 100° for from 7 to 9 hr., and then fumigated with hydrocyanic acid gas, were all killed by a concentration that reached a maximum of 3.6 mg per liter, had a mean of 1.67 mg per liter, and required 44 min. to drop to 0.4 mg per liter. An average of the curves drawn from single fumigations made in the fumigation chamber which produced slightly under 100 percent kill shows a maximum concentration of 2.9 and a mean concentration of 1.56 mg per liter, with a drop to 0.4 mg per liter in 38.5 min.

"Multiple or 'interval' fumigations were found to be less effective than those in which the same total amount of material was used in one dosage, giving a higher maximum concentration but a shorter exposure.

"The cost of fumigation per unit with sodium cyanide is about one-half that with either of the other two materials. It is recommended that on account of the leakage encountered in many of the houses the dosage for the average mushroom house be increased to 10 oz. of sodium cyanide or to 5 oz. of the liquid hydrocyanic acid per 1,000 cu. ft. of air space."

Notes on citrus pests new or seldom injurious in California, R. S. Woglum and H. C. Lewis (*Jour. Econ. Ent., 28 (1935), No. 6, pp. 1018–1021*).—These notes relate to several insects not previously recorded as pests of citrus which have been found causing commercial damage in certain interior areas of California and Arizona, namely, the western flower thrips (*Frankliniella moultoni* Hood or *F. californicus* Moult.), the Woodlake cutworm *Xylomyges curialis* Gr. and the variegated cutworm associated with it, the cabbage looper, and the fruit tree leaf roller.

Fumigation of citrus with a form tent, A. F. Swain and R. P. Buckner (*Jour. Econ. Ent., 28 (1935), No. 6, pp. 983–989, figs. 3*).—The authors find in the fumigation of citrus trees that the concentration of hydrocyanic acid gas is lower near the tent than nearer the center of the tree. This results in a poorer scale kill on the periphery of the tree. This can be offset by the use of a form for holding the tent a foot or so away from the tree. In fact, experiments reported showed that at the periphery of the tree as much as 10 to 15 times as high a percentage of scale survived fumigation under the regular method of covering a tree as under the form. While the form used in the experiments was cumbersome and required extra time and labor to manipulate, the principle of using a form of some type was shown to be of value.

Insect enemies of shade-trees, G. W. Herrick (*Ithaca, N. Y.: Comstock Pub. Co., 1935, pp. IX+417, [pl. 1], figs. 321*).—The first three chapters of this work deal with the value of shade trees and general methods of protection from insect attack (pp. 1–7), the materials and apparatus for the control of tree and shrub insects (pp. 8–19), and suggestions for the treatment of weakened trees (pp. 20–27). The chapters which follow, 27 in number, deal largely with the shade tree insects by their host trees.

The holly scale Aspidiotus britannicus Newstead and other insect pests of English holly in Oregon, J. R. Roaf and D. C. Mote (*Jour. Econ. Ent., 28 (1935), No. 6, pp. 1041–1049, figs. 2*).—The introduced holly scale *A. britannicus*, the most important pest of English holly in Oregon, may seriously weaken infested plants, while its presence detracts from the ornamental and decorative value of plants and cuttings, approximately $50,000 worth of which were exported in 1934. Notes on its life history and habits are presented, with a list of 20 references to the literature. The chalcids *Aphytis* (*Aphelinus*) *mytilaspidis* (LeB.) and *Aspidiotiphagus citrinus* (Crawf.) were reared from the scale.

In work at the Oregon Experiment Station good results were obtained with the use of oil emulsion sprays, 3: 100 (viscosity 75 Saybolt sec., sulfonation test not less than 85), applied in the early spring. Limited tests indicate that Cyanogas A dust may be of value in combating this pest.

Notes are also presented on the oblique-banded leaf roller and the soft scale, minor pests of English holly in Oregon.

Insect pests of the household, L. Haseman (*Missouri Sta. Bul. 356 (1935), pp. 27, figs. 12*).—A practical account.

Flour storage, C. H. Briggs (*Northwest. Miller, 184 (1935), No. 2, Sect. 2, pp. 17, 48*).—It is pointed out that if wheat contains insects or insect eggs they will be destroyed during the milling process. Even the eggs of insects are of larger dimensions than can pass the meshes of the silks used in bolting flour. When contamination takes place after milling, it is the result of the hatching out of insect eggs deposited in or on the flour sacks. More than 90 species of insects and spiders have been noted in flour and other cereal products, a list of which is included.

The vacuum fumigation of flour products with hydrocyanic acid, H. D. Young, G. B. Wagner, and R. T. Cotton (*Jour. Econ. Ent., 28 (1935), No. 6, pp. 1049–1055, figs. 4*).—The authors present an account, with figures giving the results of vacuum fumigation of flour products, of a method which has proved effective in obtaining a quick and thorough penetration of various products. For general purposes it is believed that a dosage of 8 oz. for every 10,000 lb. of flour products for a 3-hr. exposure will be effective against all stages of the flour beetle. This dosage is based on the use of a vacuum of 28 in. and with flour temperatures of 70° F. or higher.

Factors concerned in the deposit of sprays.—I, The effect of different concentrations of wetting agents, G. S. Hensill and W. M. Hoskins (*Jour. Econ. Ent., 28 (1935), No. 6, pp. 942–950, figs. 2*).—"Determination of the deposit of oil and of lead arsenate with different concentrations of blood albumin spreader, Kayso, and triethanolamine oleate shows that maximum deposit is obtained under the condition that a constant volume of each spray is applied to equal areas of wax, with a characteristic concentration of each wetting agent and not with the mechanical mixtures containing none. This indicates that the surface is altered at different rates and to different extents by the various wetting agents."

Silicates of soda incorporated with lead arsenate in the last regular spray an aid to residue removal, C. L. Fluke, E. P. Dunn, and P. O. Ritcher

(*Jour. Econ. Ent.*, 28 (*1935*), *No. 6, pp. 1056–1058*).—The results of a season's experiment at the Wisconsin Experiment Station are reported.

A discussion of various oils in spray combinations with lead arsenate, cryolite, and barium fluosilicate, C. O. Persing (*Jour. Econ. Ent.*, 28 (*1935*), *No. 6, pp. 933–940*).—Work conducted at the California Citrus Experiment Station is reported. In a brief study made of the effect of various oils on the deposit of standard lead arsenate on apple surfaces, it was found that in general fish oils and vegetable oils were far more effective in depositing larger amounts of lead arsenate than were the straight highly refined mineral oils.

It is pointed out that "the highly refined mineral oils used in sprays are composed chiefly of saturated straight chained hydrocarbons, whereas fish oils and vegetable oils contain relatively large amounts of compounds with polar radicals. Since it is a well-established fact that polar radicals increase the wetting power of oils, certain experiments relating to this matter were conducted. Polar radicals were introduced into straight mineral oils by the addition of small quantities of stearic, palmitic, and oleic acids. It was found that these additions increased the wetting power of the oil to such an extent that they afforded lead arsenate deposits comparable with the fish oils and vegetable oils. From these observations it was concluded that the wetting property of an oil is probably the most important single factor that determines its efficiency in deposition and subsequent adhesion of lead arsenate.

"Extensive insectary tests were conducted with newly hatched codling moth larvae on apples, using straight mineral oils and mineral oil-oleic acid combinations. Oils that contained from 1 to 10 percent of oleic acid by volume were greatly superior to straight mineral oils in the amount of lead arsenate deposited, as was determined by toxicity to codling moth larvae and by arsenical analysis of the residue on sprayed fruit."

It was clearly demonstrated that "(1) there was a great difference in the behavior of the various types of mineral oil emulsions with the fluorine compounds used. (2) Some of the oils possessed very great wetting power, as was evidenced by the fact that the particles of these fluorine compounds were centralized in the oil phase of the emulsion, which point was determined microscopically. (3) In all cases where the cryolite or barium fluosilicate remained in the oil phase, there was a very heavy visible deposit, excellent spreading and wetting, and relatively high toxicity to codling moth larvae on ripe apples. (4) In general the so-called emulsive oils were much more efficient in spreading and depositing cryolite or barium fluosilicate than were the other types of emulsions that were used. (5) With certain of the emulsive oils, better results were obtained by thoroughly mixing the cryolite or barium fluosilicate in a thin paste before adding to the tank."

Adhesives for cryolite suspensions, L. B. Ripley and G. A. Hepburn (*Union So. Africa Dept. Agr., Sci. Bul. 122* (*1934*), *pp. 12, figs. 3*).—The authors describe simple methods for determining the relative adhesiveness and relative suspendibility of insecticidal suspensions.

"Of many adhesives studied with natural and synthetic cryolite boiled linseed oil gives best results. The relative value of the other adhesives is indicated in a table. The proportions of oil and powder giving optimum adhesiveness consistent with satisfactory suspendibility have been determined for both kinds of cryolite. The best results are obtained by agitation of the hot mixture. Various details of manufacture are discussed. Natural cryolite is far superior to synthetic as regards adhesive value, giving much better adhesiveness with considerably less oil. Its suspendibility, however, although generally satisfactory is not nearly as high as that of the synthetic product."

Dormant and delayed dormant sprays for aphids and red-spiders, S. W. Frost (*Penn. State Hort. Assoc. Proc., 76 (1935), pp. 107–110, 112–114*).—The details of experiments conducted during the spring of 1934 are given in 10 tables. It was found that the period for the application of the delayed dormant spray is somewhat limited, but on the whole more extended than the dormant, and the temperatures are usually above 45° F.

The work indicates that 3 percent actual lubricating oil will kill the unhatched eggs of the red spider as well as the aphids which have hatched at the time. Lime-sulfur at the rate of 3 gal. to 100 can be added as a fungicide to lubricating oil emulsions. This apparently increases the ovicidal value of the spray.

Respiratory ventilation in the cockroach in air, in carbon dioxide, and in nicotine atmospheres, R. L. Kitchel and W. M. Hoskins (*Jour. Econ. Ent., 28 (1935), No. 6, pp. 924–933, figs. 2*).—The work reported has shown that a directed tracheal ventilation from front to rear is normal in the Hawaiian cockroach *Nyctobora noctivaga* Rehn.

"The influence of carbon dioxide is twofold. It comprises an initial stimulus whose intensity varies directly with the concentration and an anesthetic effect which becomes noticeable after a period whose duration varies inversely with the concentration. With concentrations of over 15 percent the great initial acceleration of ventilation is succeeded at once by a decrease, and in atmospheres containing 50 percent or more of carbon dioxide the insects soon become motionless. Directed ventilation does not cease on account of opening of the spiracle but because respiratory movements stop. The anesthesia occurs in undiluted carbon dioxide so quickly that the initial acceleration of ventilation cannot be detected. No permanent harm results from limited exposure to carbon dioxide, for individuals revive after being kept in closed bottles of carbon dioxide for an hour or longer."

Factors influencing citrus thrips damage, H. C. Lewis (*Jour. Econ. Ent., 28 (1935), No. 6, pp. 1011–1015, fig. 1*).—The factors involved in the amount of injury caused by the citrus thrips, which varies noticeably from season to season independent of the number of thrips present, are dealt with.

In the 6-yr. period 1929 to 1934, inclusive, citrus thrips injury to navel oranges in central California was most dependent on the temperature during the critical period while the fruit was tender and susceptible to severe injury. High temperatures at this time resulted in increased injury, while low temperatures resulted in a decrease of damage. Rainfall and weather during the spring previous to this period did not apparently influence damage; also, the abundance of thrips previous to this period was no certain index to the amount of damage to be expected. It is, therefore, impossible to forecast seasons of light or severe damage, and as the sulfur dusting program, the winter spray program, and the spring spray program all commence well in advance of this critical period, the grower, in order to obtain high-quality fruit, is compelled to make one of the thrips control programs a regular annual feature of citrus production."

Thrips as vectors of plant disease, S. F. Bailey (*Jour. Econ. Ent., 28 (1935), No. 6, pp. 856–863*).—The observations here reported, presented with a list of 50 references to the literature, indicate that in the cases of proved transmission of viruses there is some biological relation between the virus and its vector.

The grain bug Chlorochroa sayii Stål in Montana, with special reference to the effects of cold weather, R. L. Patton and G. A. Mail (*Jour. Econ. Ent., 28 (1935), No. 6, pp. 906–913, figs. 4*).—In experimental work at the Montana Experiment Station with Say's stinkbug, the literature relating to which is quite limited, it was found that temperatures between —13° and —19° C. caused death in over two-thirds of the trials made in the laboratory. "This figure is substantiated by the 70 percent mortality found in the field after exposure of the hibernation quarters to temperatures varying from —13.9° to —17.8°. In observations made in the laboratory, it was noticed that the insects became active and fed readily soon after coming out of hibernation and that the females did not oviposit until from 16 to 20 days after being brought out. The eggs showed a doubling of development rate with a rise of 10° in temperature.

"Burning of infested weedy stubble fields at the proper time results in a great diminution in the numbers of this pest."

The white apple leafhopper (Typhlocyba pomaria McA.), T. Armstrong (*Canad. Jour. Res., 13 (1935), No. 4, Sect. D, pp. 72–84, pl. 1, fig. 1*).—In studies made at the Vineland Station, Ont., two generations a year of the white apple leaf hopper were observed. Winter is passed in the egg stage, the newly hatched nymphs making their appearance in May, and the adults are present on the trees in June and July. Summer eggs are deposited chiefly in the midribs of the foliage, and take from 20 to 64 days to hatch. The second generation of adults matures in August and September. Detailed information on all phases of the life history is presented, including the type of feeding and nature of the injury produced on apple foliage. The associated species of leaf hoppers which cause injury to apple are listed.

Hybrid vigor and other factors in relation to chinch bug resistance in corn, R. H. Painter, R. O. Snelling, and A. M. Brunson (*Jour. Econ. Ent., 28 (1935), No. 6, pp. 1025–1030, fig. 1*).—In this contribution from the Kansas Experiment Station in cooperation with the U. S. Department of Agriculture an account is given of the experimental methods employed and conditions obtaining and the results obtained in the course of work at Manhattan, Kans., in 1934 and at Lawton, Okla., in 1933 and 1934, the details being given in four tables.

The results obtained indicate that there is a reasonable range of resistance in corn to chinch bugs in inbred lines, hybrids, and open-pollinated varieties. The rather high correspondence between the results of varieties at Lawton for 2 yr. indicates that the differences are real and not fortuitous.

An abridged catalogue of certain Scutelleroidea (Plataspidae, Scutelleridae, and Pentatomidae) of China, Chosen, Indo-China, and Taiwan, W. E. Hoffmann (*Lingnan Univ. Sci. Bul. 7 (1935), pp. IV+294, figs. 2*).—In addition to the catalog, an annotated bibliography (pp. 187–257) and two appendixes are presented.

Observations on winter survival of pea aphid eggs, T. E. Bronson (*Jour. Econ. Ent., 28 (1935), No. 6, pp. 1030–1036, figs. 2*).—In experiments conducted at Madison, Wis., during the four winter periods 1929–30 to 1932–33, inclusive, low or sharply fluctuating winter temperatures did not result in a low survival of pea aphid eggs. "Cool and cloudy weather during the period just previous to hatching resulted in a low survival of the protected eggs from which the coverings had been removed a short time before, but apparently did not affect adversely the hatching of the exposed eggs. Warm, sunny weather during the period immediately prior to hatching resulted in a closely comparable survival of the eggs in both the protected and the exposed locations. The pea aphid eggs that were protected by artificial covering did not show a greater percentage of survival than those eggs that were exposed to the elements and occasionally were protected by snow.

"During the spring of 1932–33 a relatively low percentage of eggs hatched. It was observed in the fall of 1932 that the eggs were dull and wrinkled, in contrast to their normal shiny and plump appearance, indicating an apparent departure from their normal condition.

"The rate of survival of all eggs under observation during the 4 yr. of varied weather conditions was 26.8 percent; for all eggs except those covered against sun and precipitation it was 30.3 percent; and for all exposed eggs it was 33.1 percent. The survival for individual lots ranged from 5.5 to 49.5 percent."

The green peach aphid.—Further observations, K. M. Ward (*Jour. Dept. Agr. Victoria, 33 (1935), No. 10, pp. 500–506, figs. 7*).—Further observations of the green peach aphid (E. S. R., 72, p. 225) have shown that outbreaks of this aphid in the Goulburn Valley of Victoria are associated with "(1) high summer rainfall, which stimulates the growth of certain plants that provide food for the aphid in summer and early autumn, and (2) spring conditions of temperature which remain approximately the same through September and October, and which rarely rise above the temperature at which activities of the insect are inhibited. The data suggest that the most severe outbreaks are likely to occur in those years in which these two sets of conditions follow each other."

Studies on biological control of Pseudococcus brevipes (Ckl.) in Jamaica and Central America, W. Carter (*Jour. Econ. Ent., 28 (1935), No. 6, pp. 1037–1041*).—From the Hawaiian Pineapple Producers' Experiment Station the results of studies of the natural enemies of the pineapple mealybug in Jamaica and Central America are reported. Specific parasites of this mealybug were found to be extremely rare or entirely absent in the areas investigated. Predators only, particularly *Pseudiostata nebulosa* Coq., appeared to be operating, but none of these gave any evidence of efficiency.

A study of the citrus mealybug and its association with ants in the eastern Province, B. Smit and H. J. Bishop (*Union So. Africa Dept. Agr., Sci. Bul. 125 (1934), pp. 41, figs. 12*).—Following an introduction and a discussion of mealybugs and their general life history, the authors deal with the biology of the citrus mealybug in the eastern Province, where it has become a very common pest; the effect of the mealybug on navel oranges during shipment; and its control. It was found that neither the mealybugs nor their eggs were killed by an average temperature of 39.7° F. in cold storage for 3 weeks, and they seemed to continue to develop slowly. Banding experiments described have shown that so long as the bands are kept in order and the branches of the trees off the ground complete control of the ants in the trees is assured.

Progress report on the interval method of applying oil sprays for the control of the California red scale on lemons, W. Ebeling (*Jour. Econ. Ent., 28 (1935), No. 6, pp. 965–971, fig. 1*).—In studies at the California Citrus Experiment Station of the effect of oil sprays on the California red scale the author found that they readily kill all stages below the mature adult.

The outstanding results that have been obtained with the interval method of oil spray application in at least three of the experiments here reported warrant an extensive and thorough study of the method with a view of determining whether it should supplant present oil spray methods, at least in the case of red scale on lemons. It is considered possible that "in cases of heavy infestations, where three sprays are required to control the insects during the first year the interval treatment is used, these may be reduced to two properly timed sprays on subsequent years. Commercial trials on a rather large scale during the past year have demonstrated definitely the inadvisability of using light oils in the interval spray method of red scale control. This can be accounted for by the fact that light oil sprays not only deposit less oil but the oil is also absorbed by the bark with much greater rapidity than the heavier oils."

Exploratory search for natural enemies of the red scale, H. Compere (*Calif. Citrogr., 20 (1935), No. 12, pp. 371, 382–386, 388, figs. 9*).—The results of a search in South America for parasites of the California red scale are reported upon in this contribution from the California Citrus Experiment Station.

On the biology of the red scale (Chrysomphalus aurantii Mask.) in the Jordan Valley, H. Z. Klein (*Hadar, 8 (1935), Nos. 3, pp. 71–73, figs. 2; 4, pp. 115, 116*).—Studies of the biology of the California red scale, which causes severe damage in the coastal zone of Palestine and the northern Jordan Valley, are reported upon, the details being given in tables and charts. In the northern Jordan Valley, where the studies were conducted, this scale generally gives rise to five generations a year. The red scale is absent from the southern valley, due it is thought to the high temperature and the exceedingly low humidity.

Study of auxiliary gases for increasing the toxicity of hydrocyanic gas.—Part 2, Studies with citrus-infesting scale insects as indices of toxicity, F. S. Pratt, A. F. Swain, and D. N. Eldred (*Jour. Econ. Ent., 28 (1935), No. 6, pp. 975–983, figs. 2*).—Further studies (E. S. R., 70, p. 503) indicated "that although certain chemicals in the vapor phase had a very marked stimulating effect on motile black and citricola scale and that others readily stupefied them, only one in combination with HCN increased the toxicity of the latter gas to any appreciable extent. This one (methyl thiocyanate) was in itself quite toxic to scale, and it is quite probable that the increased toxicity of the combination of HCN and methyl thiocyanate was due primarily to that fact. Unfortunately such serious injury to citrus foliage resulted from the use of this combination, even when the methyl thiocyanate was used at a concentration as low as 0.02 percent by weight in air, that its use is not commercially feasible."

Observations of the habits and seasonal life history of Anarsia lineatella in California, L. S. Jones (*Jour. Econ. Ent., 28 (1935), No. 6, pp. 1002–1011, fig. 1*).—Observations of the peach twig borer made during the spring and summer of 1932 and the spring of 1933 in Sutter County, Calif., are reported.

[Wattle bagworm (Acanthopsyche junodi Heyl.) control] (*Union So. Africa Dept. Agr., Sci. Bul. 131 (1934), pp. 24, figs. 2*).—Further experiments on controlling the wattle bagworm by dusting are reported by L. B. Ripley and B. K. Petty (pp. 3–17) (E. S. R., 69, p. 78), and an inquiry into the method of controlling the wattle bagworm by salt (as proposed by J. S. Henkel and A. W. Bayer), by L. B. Ripley, B. K. Petty, and G. A. Hepburn (pp. 18–24).

Codling moth research in 1934, H. N. Worthley and L. C. Marston, Jr. (*Penn. State Hort. Assoc. Proc., 76 (1935), pp. 96–100, 102–104, 106, 107*).—Spraying experiments conducted by the Pennsylvania Experiment Station in 1934 (E. S. R., 71, p. 505) showed lead arsenate to be the best material for reducing large populations of the codling moth, that its efficiency is increased by the addition of fish oil, and that its use in six or more cover sprays may lead to difficulty in residue removal and excessive injury to foliage and fruit. The crop showing the least worms and stings was produced by two cover sprays containing lead arsenate followed by oil-nicotine in later applications, and this procedure did not exceed the residue tolerances. Fixed nicotine compounds gave too much wormy fruit, but were encouraging from the standpoint of stinging and spray injury. Certain precautions are indicated in the use of fish oil and oil-nicotine.

Tests of chemically treated bands revealed weak spots in the processes of some manufacturers who apparently entered this field in 1934. It appears that cold-dipped bands should contain about 8 lb. of the β-naphthol-oil mixture per 250-ft. roll for maximum effectiveness. A method for obtaining this weight without undue clogging of tunnels is given.

In preliminary tests light traps caught more moths than bait pails. Their possible use in heavily infested packing sheds is indicated.

A design for testing technique in codling moth spray experiments, T. R. Hansberry and C. H. Richardson (*Iowa State Col. Jour. Sci., 10 (1935), No. 1, pp. 27–35*).—This contribution from the Iowa Experiment Station describes an experimental design which enables the authors to test the technic of sampling and general plat design. "The total crop was counted, worminess being recorded from successive samples of 10 fruits each. From these series of figures, three sets of samples were selected and several analyses of variance were made to test the efficiency of the various methods of sampling. It was concluded that random selection of 300 apples gave an adequate picture of tree infestation.

"A negative correlation (—0.605) was shown to exist between crop size and percentage of wormy apples on individual trees. The correlation between crop size and worminess on 12 tree tests was significantly smaller (—0.265).

"Although no significant differences were directly demonstrable between the four tests, when the crop size was considered analysis of variance of the errors of estimate showed significant differences to exist, the test receiving oil-nicotine in the second brood sprays being definitely better than calcium or lead arsenate, and questionably better than manganese arsenate."

Further report on nicotine vapor in codling moth control, R. H. Smith and C. O. Persing (*Jour. Econ. Ent., 28 (1935), No. 6, pp. 971–975*).—The results of further tests (E. S. R., 72, p. 508) made by the California Citrus Experiment Station in 1935 up to July 5 with a view to determining the efficiency of open-air treatments of nicotine vapor, applying the vapor when the atmosphere is calm as in the application of insecticide dusts, are reported upon.

The observations indicate that it will be possible to kill the moths in an orchard at any given time by the use of 15 to 30 cc of 50 percent nicotine per tree. The dosage required will depend on the size of the trees and upon conditions that influence the dispersion or drifting of the vapor.

The experimental application of calcium arsenate for codling moth control in an arid region, J. Marshall (*Jour. Econ. Ent., 28 (1935), No. 6, pp. 960–965*).—Studies conducted at the Washington Experiment Station in 1933 and 1934 are reported upon.

Although it has not yet been possible to increase the effectiveness of calcium arsenate to the point that lead arsenate may be improved (by the addition of, for instance, petroleum oil-oleic acid and triethanolamine), there are now good indications that it may shortly find considerable use in the arid apple-growing regions if present lead residue restrictions are maintained or increased.

Codling moth control and spray residue studies in California, A. D. Borden (*Jour. Econ. Ent., 28 (1935), No. 6, pp. 951–956, figs. 3*).—This is a report of field and laboratory studies conducted in northern California during three seasons, directed toward the determination of the best means of obtaining a suitable deposit of insecticides and to determine by chemical analysis the amount of arsenic left at harvest time after spray treatment.

No substitute was found for standard lead arsenate, especially in the first two sprays. Natural cryolite, synthetic cryolite, manganese arsenate, calcium arsenate, oil-nicotine, and nicotine bentonite when used throughout the season failed to give satisfactory control, though some of these showed promise when used in late cover sprays following lead arsenate in the first two applications.

It was shown in 1934 and 1935 that the highest deposit of lead arsenate per square inch of surface is attained in the calyx spray, with the next highest in the first cover spray. The high deposit in the calyx spray is considered due to the roughened surface of the calyx cup and the pubescence of the fruit surface. It has been found that from 75 to 80 percent of this load is often in the calyx cup itself. As the fruit starts to grow and the surface becomes more resistant to the wetting and spreading of the spray, the deposit at each spray application is materially lessened.

Further observations on the attractiveness of esters of the ethyl acetate series to the codling moth, J. R. Eyer (*Jour. Econ. Ent., 28 (1935), No. 6, pp. 940–942*).—Further experiments conducted at the New Mexico Experiment Station (E. S. R., 65, p. 853) indicate that "fermenting sugar and vinegar baits are attractive to the codling moth through their formation of certain fruity esters, somewhat similar in their general nature to ethyl acetate. The latter are derivatives of monobasic sugar acids and occur both in fermenting sugar solutions and free in nature in the essential oils of the fruits, flowers, and foliage of living plants. Of the many representatives of this group tested, isobutyl phenyl acetate and ethyl oxyhydrate are most consistent in their attraction of the codling moth in southern New Mexico."

Codling moth and the weather, R. L. Webster (*Jour. Econ. Ent., 28 (1935), No. 6, pp. 956–960*).—A contribution from the Washington Experiment Station.

The codling moth in Persian walnuts, A. M. Boyce (*Jour. Econ. Ent., 28 (1935), No. 6, pp. 864–873, figs. 2*).—This is a contribution from the California Citrus Experiment Station in which it is shown that the codling moth problem on Persian walnuts differs in many respects from that of pome fruits. Its control at present is relatively simple because of the inherent resistance of the host to attack by the larvae.

The hessian fly and its control, L. Haseman (*Missouri Sta. Circ. 188 (1935), pp. 4, fig. 1*).—A practical account, including a map showing the fly-free dates, wheat sown on or after which in Missouri will escape fall fly injury

Mosquito-control activities in the Pacific Northwest under the CWA program, H. H. Stage (*Jour. Econ. Ent., 28 (1935), No. 6, pp. 1022–1024*).—A brief account is given of the mosquito control work conducted in the Pacific Northwest during the winter of 1933–34.

Protection from mosquito bites in outdoor gatherings, J. M. Ginsburg (*Science, 82 (1935), No. 2134, pp. 490, 491*).—In experiments conducted by the New Jersey Experiment Stations it was found that the mosquito larvicide first described by the author in 1930 (E. S. R., 64, p. 160), which contains a light petroleum oil and pyrethrum and is harmless to fish, waterfowl, and vegetation, is toxic as well as repellent to adult mosquitoes, and can be economically applied to partially or completely protect an outdoor gathering such as carnivals, picnics, open-air theaters, lawn parties, etc., from annoyance by spraying the area with the larvicide diluted 1:10 or 1:12 with water and without discomfort to the audience. The spray is applied ½ hr. before the gathering takes place with a power machine under 100 lb. pressure per square inch as a fine fog, covering the grass, ground, shrubs, and filling the air. Thus far, the larvicide has been found effective against *Culex pipiens*, *Aedes vexans*, the salt-marsh mosquito, and *Mansonia perturbans*.

The formula, which has been improved to be compatible with hard and salt water, consists of 100 gal. of kerosene containing pyrethrum extract equivalent to 1 lb. of flowers (analyzing 0.9 percent pyrethrins) per gallon, 50 gal. of water, and 6 lb. of sodium laurel sulfate (emulsifier).

Factors stimulating hatching of eggs of Gasterophilus intestinalis De Geer and the application of warm water as a practical method of destroying these eggs on the host, E. F. Knipling and R. W. Wells (*Jour. Econ. Ent.,* *28 (1935), No. 6, pp. 1065–1072, fig. 1).*—The studies here reported have shown that the eggs of the horse botfly can be destroyed indirectly by the application of warm water, at suitable temperatures, to the infested portion of the host. Such a treatment provides the factors which stimulate the larva to leave the eggshell at once, after which it dies from exposure.

Color preferences of the house fly (Musca domestica L.), S. B. Freeborn and L. J. Berry (*Jour. Econ. Ent., 28 (1935), No. 6, pp. 913–916, fig. 1*).—The authors find that house flies, when given a choice, will show a marked preference for one color over another, providing the physical surface is identical. It is concluded that aluminum paint has no particular value as a fly repellent.

Heat sterilization of mangoes and guavas for fruit flies, F. Seín, Jr. (*Jour. Agr. Univ. Puerto Rico* [*Col. Sta.*], *19 (1935), No. 2, pp. 105–115*).—Some mango varieties and apparently all guavas in Puerto Rico are infested by fruit flies, resulting in their exclusion from exportation to the United States. The author has found that a variety of the South American *Anastrepha fraterculus* Wied. (the West Indian fruit fly) which he has described as *A. fraterculus* var. *mombinpraeoptans* (E. S. R., 71, p. 76) is the one that breeds in some of the mango varieties. The species that breeds in guavas he has described as *A. unipuncta* (E. S. R., 71, p. 76), although considered by Greene (E. S. R., 71, p. 818) to be *A. suspensa* Loew.

Experimental sterilization work has shown that a temperature of 43° C. for 8 hr. in a circulating atmosphere saturated with moisture kills the eggs, maggots, and pupae of the fruit flies that infest mangoes and guavas in Puerto Rico without unfavorably affecting the flavor, appearance, or keeping qualities of the fruit if it is afterward placed in refrigeration. "The varieties that could be sterilized are the Mayaguez mango, the Girón, the Columbo Kidney, and some of the better ones from Vieques. Since the period of sterilization of 8 hr. can be reduced to 4 hr. without rendering the treatment less effective in destroying the insect, the margin of safety is very large. Mangoes can be rendered free from fruit fly infestation by sterilization for 8 hr. at 43° piled on trays, crated, or wrapped in paper and crated."

A new species related to Agromyza virens Loew (Dipt.: Agromyzidae), S. W. Frost (*Ent. News, 45 (1934), No. 2, pp. 40, 41*).—*A. angelicae*, reared as a stem miner on *Angelica atropurpurea* in Ithaca, N. Y., and also taken at Pacific Grove, Calif., is described as new.

The Chloropidae of Kansas (Diptera), C. W. Sabrosky (*Amer. Ent. Soc. Trans., 61 (1935), No. 3, pp. 207–268, fig. 1*).—A contribution from the Kansas Experiment Station on the dipterous family Chloropidae, in which 84 forms are recognized.

A comparison of criteria of susceptibility in the response of Drosophila to hydrocyanic acid gas.—I, Stupefaction time and mortality, C. I. Bliss and B. M. Broadbent (*Jour. Econ. Ent., 28 (1935), No. 6, pp. 989–1001, figs. 3*).—A comparison is made of the value of stupefaction time and mortality for measuring the action of hydrocyanic acid gas on the pomace fly.

Some observations on the overwintering habits of the American elm bark beetle Hylurgopinus rufipes Eichh., W. B. Becker (*Jour. Econ. Ent., 28 (1935), No. 6, pp. 1061–1065, figs. 2*).—Studies conducted at the Massachusetts Experiment Station during 1934–35 are said to have shown that adults of *H. rufipes* spend the winter in short "hibernating" tunnels which they dig into the bark of apparently healthy elm trees. "These winter tunnels are about 1.5 mm wide and seldom more than 2 cm long. Some are straight and others curved, and they may extend in any direction with relation to the grain of the bark. The entrance holes are in the crevices, and the tunnels generally are dug in the outer layers of the bark, but quite often they go directly in toward the sapwood, scoring it slightly. Wherever a tunnel penetrated through the bark to the cambial region of the tree, the sap which flowed from the wound drowned out the beetle, causing the beetle to start another tunnel elsewhere."

These winter tunnels differ from the characteristic egg galleries of this insect which are in the inner bark and are of the forked transverse type, having the entrance hole near the center of the completed gallery and usually extending more or less across the grain of the bark, with egg niches along both sides from which the larval galleries later extend.

During the summer of 1935 only one generation of beetles was reared. No larvae were found overwintering at Amherst, though it is considered possible that the early emerging adults may start a second generation which may pass the winter in the larval stage.

A correction in the recorded hibernation habits of two species of Ips bark beetles in Minnesota, L. W. Orr (*Jour. Econ. Ent., 28 (1935), No. 6, pp. 1021, 1022*).—Contributing from the Minnesota Experiment Station, the author calls attention to the fact that in that State *I. pini* and *I. grandicollis* do not overwinter under the bark of the trees in which they develop. It is pointed out that this has an important bearing on recommendations for control work, since the cutting and treating of beetle-killed trees during the late fall, winter, or early spring will not destroy the insects.

[Descriptions of new beetles from Puerto Rico and the Virgin Islands] (*Jour. Agr. Univ. Puerto Rico [Col. Sta.], 19 (1935), No. 2, pp. 51–71*).—The contributions presented are as follows: New Cerambycid Beetles from Puerto Rico (pp. 51–63) and New Eucnemid Beetles from Puerto Rico (pp. 65, 66), both by W. S. Fisher, and New Species of Scarabaeidae (Coleoptera) from Puerto Rico and the Virgin Islands, by E. A. Chapin (pp. 67–71).

Origin of color in western beeswax, G. H. Vansell and C. S. Bisson (*Jour. Econ. Ent., 28 (1935), No. 6, pp. 1001, 1002; also in Gleanings Bee Cult., 63 (1935), No. 10, pp. 593, 594*).—The color imparted to beeswax and other solvents by some pollens at Davis, Calif., is recorded in a table. The authors' studies, by the U. S. D. A. Bureau of Entomology and Plant Quarantine and the California Experiment Station cooperating, clearly show that the hues of the local crude beeswaxes, excluding the metal stains, originate for the most part from the pollens.

Celotex protection for bees, J. A. Munro (*Gleanings Bee Cult., 63 (1935), No. 10, pp. 585–588, figs. 5*).—A practical contribution from the North Dakota Experiment Station.

A revision of the genus Megachile in the Nearctic region, II, III, T. B. Mitchell (*Amer. Ent. Soc. Trans., 61 (1935), Nos. 1, pp. 1–44, pl. 1; 3, pp. 155–205, pls. 2*).—A further contribution from the North Carolina Experiment Station (E. S. R., 71, p. 355).

Problems in the storage of Anastatus semiflavidus Gahan, an egg parasite of the range caterpillar, O. L. Barnes and J. C. Frankenfeld (*Jour. Econ. Ent., 28 (1935), No. 6, pp. 917–924*).—Studies have shown that "the egg of *A. semiflavidus* is not a suitable stage for storage at constant temperatures of 35°, 38°, 42°, or 46° F. for long periods. In general, parasite survival decreases as the period of exposure at constant low temperatures increases. The mature parasite larvae, apparently in a resting condition several days after consumption of the contents of the host egg, is the most resistant stage for withstanding low temperatures for long periods. Results of refrigeration tests at 35°, 38°, 42°, and 46° indicated that parasite mortality increased as the temperature was lowered. Mature larvae of *A. semiflavidus* survived a temperature of 52° for periods of 3, 6, or 8 mo., the minimum survival rate being 88 percent.

"Parasitized range caterpillar eggs should be held at approximately 75° for 20 to 40 days (or at moderate, variable temperatures until the developing parasites have reached an equivalent stage of growth) before storage at 52°. A constant temperature of 85° is quite suitable for parasite development following storage.

"Mass parasite-rearing operations are easily adjusted to fit the conditions necessary to secure a minimum of mortality in storage."

The Pacific mite Tetranychus pacificus McG. in California, J. F. Lamiman (*Jour. Econ. Ent., 28 (1935), No. 6, pp. 900–903, fig. 1*).—A brief account of this mite enemy of certain deciduous fruits, vegetables, field crops, ornamentals, etc.

Notes on insecticide trials with date palms, Kut as-Sayyid Estate, 1934, V. H. W. Dowson (*Hadar, 8 (1935), No. 6, pp. 174, 175*).—The date mite identified as *Oligonychus simplex* Banks or a closely related form is said to be the most serious pest of Basrah date palms. The results of insecticide trials with date palms and the amount of insecticides used as sprays and dusts on palms are reported in tables.

Tick transmission of California relapsing fever, W. B. Herms and C. M. Wheeler (*Jour. Econ. Ent., 28 (1935), No. 6, pp. 846–855, fig. 1*).—Studies of *Ornithodoros hermsi*, described by Wheeler as new to science (E. S. R., 74, p. 100), indicate that in California the transmission of relapsing fever due to *Spirochaeta recurrentis* is effected by both male and female ticks and in the later nymphal stages, no proof having been obtained as yet that the larval stage is infective.

The economic status of the garden centipede (Scutigerella immaculata (Newp.)) in California, A. E. Michelbacher (*Jour. Econ. Ent., 28 (1935), No. 6, pp. 1015–1018*).—A general discussion of the importance of this very destructive enemy of field crops and plants grown under glass in California, accounts of which by the author (E. S. R., 69, p. 87) and by Wymore (E. S. R., 66, p. 456) have been noted.

ANIMAL PRODUCTION

[Livestock investigations in Illinois] (*Illinois Sta. Rpt. 1934, pp. 71–78, 88–101, 102–108, 113–119, figs. 2*).—Studies with beef cattle yielded information on a comparison of systems of maintaining beef cows, reducing bloat on alfalfa pasture by feeding ground ear corn, and the effect of "toasting" soybean oil meal on palatability, all by H. P. Rusk and R. R. Snapp; delayed bleeding and its relation to dark-cutting beef carcasses, by S. Bull; and simplification of net energy evaluation of feeds, by H. H. Mitchell, T. S. Hamilton, and W. T. Haines.

In swine studies, results were obtained on protein supplements to cheapen pork on alfalfa pasture, comparison of oats and corn for brood sows, and supplements to hulled oats for growing pigs, by W. E. Carroll and W. P. Garrigus; amount of protein needed for maximum swine growth, and simple mixtures for the mineral needs of swine, both by Carroll, Garrigus, Mitchell, and Hamilton; effect of diseased corn on rate of fattening of pigs, and grinding corn for swine, both by Garrigus, Mitchell, and F. Simpson; the importance of copper in anemia control, by Mitchell and Hamilton; and swine selection for rapid- and slow-growing strains, by E. Roberts and Carroll.

The sheep tests yielded information on utilizing alfalfa pasture to best advantage in lamb feeding, silage as a low-cost roughage for breeding ewes, and corn silage and alfalfa hay compared as roughages for lamb feeding, all by W. G. Kammlade.

Poultry investigations yielded data on a comparison of soybean meals and ground soybeans for chicks, and influence of feeding on egg quality, both by H. J. Sloan and L. E. Card; vitamin E requirements of chicks for normal growth, and effects of vitamins in egg yolk on deficiency symptoms of chicks, by Sloan, Card, and F. B. Adamstone; and management of pullets to increase winter egg production, by Card, Sloan, and H. H. Alp.

Studies of hair production on hairless rats by skin transplants, by Roberts and E. E. Slatter, are also noted.

[Livestock investigations by the Wisconsin Station] (*Wisconsin Sta. Bul. 430 (1935), pp. 116–121, 137–142, 144–149, figs. 4*).—Data obtained in tests with livestock are reported on the method of preparing soybean oil meal as regards its value as a protein supplement in pig rations, by G. Bohstedt, J. M. Fargo, J. W. Hayward, and H. Steenbock; cheese meal v. tankage in pig rations, by Bohstedt and Fargo; use of large quantities of skim milk and whey for growing and pregnant gilts, by Fargo; the effectiveness of sod or dirt in preventing anemia in pigs, by Fargo, W. M. Beeson, and H. J. Deobald; the high cost of molasses for use in livestock rations, by Bohstedt, B. H. Roche, P. E. Newman, Fargo, I. W. Rupel, and J. G. Fuller.

Investigations with poultry resulted in data on the effect of the vitamin D content of the hen's ration on the vitamin requirements of baby chicks hatched from the eggs laid by such hens, by B. E. Kline, C. A. Elvehjem, and J. G. Halpin; effect of kiln drying of grains on certain vitamins, and the cause of one type of paralysis in poultry, both by O. L. Kline, J. A. Keenan, Elvehjem, and E. B. Hart; the relationship of blood calcium to egg formation in the hen, by H. R. Knowles, Hart, and Halpin; the role of sulfur in the ration of growing chicks and laying hens, by B. Kline, Hart, Halpin, and C. E. Holmes; correlation between size of egg and weight of day-old chicks and rate of growth, rye for growing pullets, laying hens, and baby chicks, the effect of the kinds of grain fed on the bones of chicks, and the relationship between too much phosphorus and slipped tendon, all by Halpin and Holmes; and excessive amounts of fishmeal in the chick ration, by Halpin, Holmes, Elvehjem, and Hart.

A new toxicant occurring naturally in certain samples of plant foodstuffs, IX–XI (*Jour. Nutr., 10 (1935), Nos. 2, pp. 213–221, figs. 5; 223–231, figs. 4; 3, pp. 233–239, figs. 5*).—This series of investigations (E. S. R., 74, p. 378) at the South Dakota Experiment Station has been continued.

IX. *Toxic effects of orally ingested selenium*, K. W. Franke and V. R. Potter.—Feeding small quantities of sodium selenite in an otherwise adequate diet for rats produced symptoms of poisoning virtually identical with the symptoms produced by the natural plant toxicant. The symptoms considered were growth, food intake, hemoglobin levels, and gross pathology. While these factors alone were not conclusive, they support the conclusion that selenium is closely associated with the natural toxicant.

X. *The effect of feeding toxic foodstuffs in varying amounts and for different time periods*, K. W. Franke.—In this phase of the study it was shown that the feeding of a ration containing only 17.5 percent of toxic grain still produced depressed growth rates and also caused deaths. When the ration contained 35 percent or more of toxic grain the depression of growth and numbers of deaths were increased. Pathological effects resulted from even a 10-day period of toxic grain feeding, and while normal growth was resumed when rats were changed to the control diet the damage to the organs was never repaired. The pathological changes decreased as the intake of toxic food decreased.

XI. *The effect of feeding toxic and control foodstuffs alternately*, K. W. Franke.—This paper reports the effect of feeding alternately diets containing toxic and control corn to simulate the consumption of vegetation by grazing animals. Growth and food consumption curves were obtained that showed rhythmic decreases and increases in all groups when the diets were changed at 5-, 10-, and 15-day intervals.

Analyses of commercial feeding stuffs and registrations for 1935, C. S. Cathcart (*New Jersey Stas. Bul. 590 (1935), pp. 57*).—Analyses are reported for protein, fat, and fiber of 1,324 samples of commercial feeding stuffs collected for official inspection during 1934, including a list of the ingredients found by microscopic examination (E. R. S., 72, p. 89).

The physiology of domestic animals, H. H. Dukes (*Ithaca, N. Y.: Comstock Pub. Co., 1935, 3. rev. ed., pp. XIV+643, figs. 169*).—This work, which includes a foreword by H. D. Bergman (p. XI), a chapter on the physicochemical basis of physiological phenomena, by E. A. Hewitt (pp. 1–15), and a part on reproduction, by G. W. McNutt (pp. 579–623), is the third revised edition of a treatise previously noted (E. S. R., 70, p. 674).

Minimum vitamin A requirements with particular reference to cattle, H. R. Guilbert and G. H. Hart (*Jour. Nutr., 10 (1935), No. 4, pp. 409–427*).—Continuing this investigation (E. S. R., 72, p. 86), this paper presents data on the quantitative vitamin A relationships that are important from practical and scientific viewpoints.

The total storage of vitamin A and carotene in the liver and body fat of cows 2 to 18 yr. old which had had access to green feed during life was estimated to be about 0.6 to 0.7 g in the younger animals and up to 3.6 g in the aged cows. Of this storage 67 to 93 percent was in the liver, while the amount in other organs was negligible. In the liver the storage was mostly in the form of vitamin A, while in the fat carotene predominated. On a carotenoid-deficient ration there were indications that the daily withdrawal from storage was 9 to 11 micrograms per kilogram of live weight. The cow whose reserves were depleted stored about 400 mg of carotene in a 13-day period, during which she ingested 240 kg of freshly cut alfalfa containing about 15 g of carotene. This showed a relatively rapid storage. The concentration of the reserves of young animals as compared with that of aged adults suggested that reserves above a certain level accumulated slowly.

Subcutaneous injections of carotene into a vitamin-A-deficient calf were followed by a disappearance of a corneal lesion and by a slight improvement in physical condition, but no gain in weight occurred. Apparently ingested vitamin A was slowly absorbed or poorly utilized. Using night blindness as a basis upon which to determine the minimum requirement, it was found that the daily minimum of the bovine was 26 to 33 micrograms per kilogram of live weight. A daily intake of carotene of 29 micrograms per kilogram prevented or cured clinical symptoms and promoted normal weight increases, but there was no storage of vitamin A and when the intake fell below this level night blindness reappeared. Normal reproduction occurred in a cow that began gestation with no reserve and whose carotene intake was maintained at about the minimum level until the last month of pregnancy, when it was increased threefold. A vitamin A deficiency that had progressed to the point of night blindness and convulsions did not inhibit the occurrence of oestrum.

The hypothesis is advanced that vitamin A requirement is related to body weight rather than to energy requirement, and that the minimum requirement of mammals is approximately 20 to 30 micrograms of vitamin A or carotene daily per kilogram of body weight. This implies that large animals require a higher percentage of vitamin A in the diet than do small animals in order to compensate for the lower feed consumption per unit of weight. The carotene requirement per unit of body weight of chickens and turkeys is considerably higher than that of mammals, showing a difference between these species in this respect.

A rickets-like disease in young cattle, T. W. GULLICKSON, L. S. PALMER, and W. L. BOYD (*Minnesota Sta. Tech. Bul. 105* (*1935*), *pp. 47, figs. 8*).—This study was undertaken to determine the cause of losses in cattle resulting from a rickets-like disease. A review of the literature suggested some form of nutritional deficiency of calcium, phosphorus, or vitamin D, or a combination of two or more of these. The relationship of the minerals and of vitamin D was ascertained by the results obtained when different levels of intake of each of these factors were provided and by noting the effect of adding each of these as a supplement to the rations of affected animals. Data on the life history of the 25 animals studied are appended.

It is concluded that this disease, which occurs in calves during the fall, winter, and spring months, was caused by failure to provide sufficient vitamin D and calcium. Various clinical forms of the syndrome may occur, depending upon the relative degree of deficiency of the two factors. This condition seriously interfered with normal growth and development. Enlargement of the joints with considerable erosion of the articulating surfaces and the production of thin, fragile walls on the shafts of the long bones were apparent. The onset of the disease was invariably followed by varying degrees of anorexia, a downward trend of the blood calcium, and a similar but less marked trend in inorganic blood phosphorus. Prevention or correction of the disease was effected by furnishing the animals with an adequate supply of calcium and vitamin D. Sunshine, viosterol, sun-cured hay, and cod-liver oil may be used to supply the vitamin D, and a good quality of legume hay or some supplement rich in calcium may supply the necessary minerals.

A survey of the sheep industry of Maryland, W. E. HUNT (*Maryland Sta. Bul. 378* (*1935*), *pp. 43, figs. 5*).—The material in this bulletin is based upon the replies to a questionnaire by about 120 sheep raisers located in 15 counties. The questions related to the breeding, feeding, management, and marketing of sheep, and to the production and marketing of wool.

The survey showed that the following factors deserved careful consideration if sheep production in the State were to be improved—(1) more general use of compact, meaty, short-legged purebred rams of medium size, (2) generous use of legume hay and winter pasture, with adequate grain when needed, (3) control of internal and external parasites, and (4) proper shearing, tying, and preparation of fleeces for market, and marketing wool according to quality.

Pineapple bran-molasses mixtures for fattening swine, L. A. HENKE and G. W. H. GOO (*Hawaii Sta., Anim. Husb. Div. Prog. Notes No. 11* (*1935*), *pp. 8*).—A series of three experiments of 76, 35, and 35 days' duration, respectively, was conducted with two lots of pigs in each test to determine the value of pineapple bran as a feed for fattening swine. The control ration was composed of barley, cane molasses, fishmeal, linseed oil meal, salt, and bone meal, while the experimental ration also included pineapple bran, somewhat more fishmeal, and somewhat less barley.

The average of the three experiments showed that the pigs made average daily gains of 0.9 and 1.6 lb., consumed 5 and 6.6 lb. of concentrates per head daily, and required 5.7 and 4.2 lb. of feed to make 1 lb. of gain on the experimental and control rations, respectively. It was calculated that the pineapple bran ration was only 74.4 percent as efficient and only 76.7 percent as palatable as the control ration.

The results also suggested that the use of pineapple bran in large quantities in swine rations be deferred until the pigs averaged at least 100 lb. per head. It was thought that because of the high fiber content better results would have been obtained if the amount of pineapple bran had been limited. The pineapple bran ration cost 68 percent as much as the control ration, but the slower gains and increased labor cost made the final cost about equal.

Supplementary values of animal protein concentrates in chick rations, H. J. ALMQUIST, E. L. R. STOKSTAD, and E. R. HALBROOK (*Jour. Nutr., 10 (1935), No. 2, pp. 193–211, figs. 2*).—The California Experiment Station conducted a series of studies to determine the cause of the extensive variations in the nutritive value of animal protein concentrates used as sources of protein in chick rations.

It was found that tankages when used for the above purpose gave decidedly inferior results, that meat scrap and cracklings gave much better but still unsatisfactory results, but that vacuum-dried beef and whale meat meal gave very satisfactory results. Analyses were made of these concentrates for the estimation of intact protein, protein decomposition products, undigestible protein, and hot-water-soluble protein. These characteristics exhibited a good correlation with nutritive value for chicks, when assigned the relative values of 100, 40, 0, and 40, respectively. The analyses offered possibilities for a rapid laboratory determination of protein quality in commercial concentrates. The cystine, tryptophane, and hydrogen sulfide content of protein concentrates could not be used as a basis for predicting their nutritive values.

The effect of feeding high amounts of soluble iron and aluminum salts, H. J. DEOBALD and C. A. ELVEHJEM (*Amer. Jour. Physiol., 111 (1935), No. 1, pp. 118–123, figs. 2*).—Day-old chicks were placed on normal diets at the Wisconsin Experiment Station, and 0.9 percent of soluble iron and 0.44 percent of soluble aluminum salts were added. The chicks developed severe rickets in from 1 to 2 weeks and were all dead within 3 weeks after being placed on this ration. Levels of iron and aluminum salts equivalent to 0.5 and 0.75 of the amount necessary to unite with the total phosphorus in the ration as iron phosphate and aluminum phosphate reduced the bone ash to about 25 percent and the blood phosphorus to from 2 to 4 mg per 100 cc of serum at 3 weeks of age. Similar results were obtained after the chicks had been on the rations only 11 days. Adding sodium acid phosphate in amounts sufficient to unite with the added metals permitted rapid growth and normal bone formation. After the addition of iron and aluminum salts a definite drop in blood phosphorus was noted as early as the fifth day, and values as low as 1.5 to 1.7 mg per 100 cc of serum prevailed by the ninth day. The possible danger from the use of high doses of iron in the treatment of hypochromic anemias is discussed.

The augmentation of the toxicity of fluorosis in the chick by feeding desiccated thyroid, P. H. PHILLIPS, H. ENGLISH, and E. B. HART (*Jour. Nutr., 10 (1935), No. 4, pp. 399–407, fig. 1*).—At the Wisconsin Experiment Station, a study was undertaken with the view of attempting to determine the influence of sodium fluoride poisoning upon chicks given desiccated thyroid in doses sufficient to cause a reaction but which were nontoxic in short periods.

It was demonstrated that the growing chick has a high tolerance to sodium fluoride administration. It appeared that factors other than selective absorption were responsible for this tolerance. Approximately 70 mg of fluorine per kilogram of body weight were necessary to inhibit growth in the chick after the first week of life, and this level of intake inhibited growth by restricting feed consumption. Intraperitoneal injections of sodium fluoride solutions also restricted feed consumption, indicating that the reaction to fluorine was systemic. With intraperitoneal injections 64 mg of fluorine per kilogram of body weight were lethal, while from 35 to 40 mg retarded growth.

Feeding desiccated thyroid in amounts greater than 350 mg per kilogram of body weight definitely retarded growth, while levels of from 200 to 225 mg were without effect. Feed consumption was not restricted by desiccated thyroid feeding. Nontoxic levels of desiccated thyroid were made distinctly toxic by chronic fluorosis induced by sodium fluoride feeding in growing chicks. In this case growth was greatly retarded and the survival period shortened. When fed with sodium fluoride, the relatively harmless level of 0.2 percent of desiccated thyroid produced results similar to that of the highly toxic level of 0.6 percent.

Antirachitic activity of vitamin D supplements for poultry, H. A. Halvorson and L. L. Lachat (*Minn. Dept. Agr., Dairy, and Food, Dir. Feed and Fert. Control, 1934, pp. 16, fig. 1*).—This pamphlet contains the results of biological assays of commercial products alleged to possess vitamin D potency, together with definitions of terms and units of measurements in common use, and registration and labeling requirements for vitamin D carriers for poultry.

The relationship of the vitamin D intake of the hen to the antirachitic potency of the eggs produced, N. B. Guerrant, E. Kohler, J. E. Hunter, and R. R. Murphy (*Jour. Nutr., 10 (1935), No. 2, pp. 167–178, fig. 1*).—This study at the Pennsylvania Experiment Station was undertaken to determine the antirachitic potency of eggs produced by hens which received diets varying only in their antirachitic potency.

It was found that the antirachitic potency of egg yolk depended on the antirachitic intake of the hen producing it. There appeared to be a limit to the ability of the hen to transfer the antirachitic factor from her diet to the egg. When the hen was fed 0.25 percent of fortified (8D) cod-liver oil (E. S. R., 72, p. 373), 1 g of the yolk from the eggs produced contained approximately 0.5 Steenbock unit. Yearling hens near the end of their period of egg production produced egg yolks that were more potent in the antirachitic factor than did pullets at the beginning of their initial egg production. This difference was thought to be due to the rate of egg production and not to the period of production. At the level studied the antirachitic factor of cod-liver oil appeared to be more definitely transferred from the diet to the egg yolk than an equal unit of the factor from viosterol.

Spectrum analysis of hen eggs and chick tissues, W. F. Drea (*Jour. Nutr., 10 (1935), No. 4, pp. 351–355*).—This investigation was made to determine what "trace" elements passed from the rations and drinking water into the blood of the laying hen, hen eggs, and tissues of chicks which had not ingested feed or water.

The elements which were found to follow the above course were aluminum, barium, calcium, copper, iron, magnesium, phosphorus, potassium rubidium (?), silicon, sodium, strontium, titanium, and vanadium. Manganese and zinc were each absent from one organ and the chick's blood. Aluminum, barium, copper, silicon, strontium, titanium, and zinc were quite uniformly distributed among the tissues. Barium, iron, strontium, and vanadium were more concentrated in the hen's blood and/or egg than in the feed, and it appeared reasonable that they were of high physiological importance. The selection of barium and strontium may be due to the inability of the hen's organism to distinguish these elements from calcium, but the selection of vanadium was not easy to explain. This latter element was present in measurable quantities in the blood of both chick and hen, in the femur, heart, kidney, and lung, which suggested some function associated with the hematopoietic organs. Boron, fluorine, and silver when present in the newly hatched chick were either unnecessary or harmful. Boron was found only in the egg yolk, but fluorine was not present in sufficiently large amounts to be demonstrated in the eggs, blood, or soft tissues. This element probably had no physiological importance, and when present in drinking water in amounts of more than 1 p. p. m. had a toxic effect. Silver though present in the water was not demonstrated in the hen's blood, egg yolk, chick blood, or tissues with the exception of one femur.

Chromium, lead, and molybdenum were present in approximately equal amounts in the hen's blood and in the feed and water, but were not constantly present in the eggs. When chicks contained molybdenum it was found principally in the liver, while lead was present in the lungs and chromium in the brain and eye. Manganese was present in greater quantities in the yolks than in hen's blood and was absent from egg white and eggshell. It was concentrated in the liver and appeared in slightly smaller quantities in the kidney and gizzard. Its absence from the chick's blood and its presence in the tissues, with the exception of the eye, indicated a probable inadequate supply of this element which is of general nutritive importance.

A guide to sexing chicks, C. S. Gibbs (*New York: Orange Judd Pub. Co., 1935, pp. 63, figs. 20*).—This guide was prepared to assist practical poultrymen in the art of identifying male and female chicks at an early age.

Poultry mortality from a business viewpoint, W. C. Thompson (*New Jersey Stas. Bul. 591 (1935), pp. 16, figs. 5*).—The material for this bulletin was assembled from the records of two New Jersey egg-laying contests. The author points out the factors that must be considered if mortality rates in both young and adult stock are to be brought under control. He also states that this mortality has been one of the most serious contributing factors to the lowered egg farm profits in recent years.

Vegetable protein in turkey rations, J. E. Hunter, D. R. Marble, and H. C. Knandel (*Pennsylvania Sta. Bul. 321 (1935), pp. 13, figs. 2*).—This study was undertaken with 184 day-old poults to determine the efficiency of using vegetable protein supplements such as soybean oil meal and corn gluten meal as partial substitutes for animal protein in turkey rations.

In the basal ration used in this test during the period from 1 to 13 weeks, the protein from 50 percent of the dried milk and 50 percent of either meat meal or fishmeal was satisfactorily replaced by either soybean oil meal or corn gluten meal, provided the calcium and phosphorus losses were compensated. In the ration fed from 13 weeks to maturity satisfactory growth was obtained when one-third or two-thirds of the total animal protein was replaced by an equal unit of soybean oil meal or corn gluten meal if calcium and phosphorus were added. When the vegetable protein concentrates were substituted for part of the animal protein concentrates in starting and developing mashes, satisfactory growth was obtained. In a 24 percent turkey starter ration 14 percent of soybean oil meal or 12.5 percent of corn gluten meal could replace equivalent amounts of animal protein. The corn gluten meal produced a satisfactory fleshing condition.

Facts and figures on squab production, C. S. Platt and R. S. Dare (*New Jersey Stas. Hints to Poultrymen, 22 (1935), No. 6, pp. 4, fig. 1*).—This publication discusses a ration which has proved satisfactory for growing squabs, the amount of feed consumed by a pair of pigeons per year, the egg and squab production, weights of squabs and their financial returns, and pedigreeing of breeding stock.

DAIRY FARMING—DAIRYING

[Report of proceedings of the World's Dairy Congress, 1934] (*Roma: Com. Naz. Latte e Derivati, 1934, Sects. 1, pp. II+187, figs. 18; 2, pp. 574, pls. 12, figs. 20; 3, pp. 210; 4, pp. II+125, figs. 3; 5, pp. II+140, fig. 1; 7, pp. II+128, figs. 9*).—Executive material and other miscellaneous information, together with the following papers in addition to those noted elsewhere, which were presented at the various sections of the Congress, held April 30 to May 6, 1934, at Roma (Rome) and Milano (Milan) are included in this report.

Cattle breeding and milk production.—Influence of the Time of Feeding on the Secretion and Composition of the Milk, by J. Groh (pp. 1–7); A New Use for Surplus Whey—"Whey Silage," by J. Golding (pp. 9–13); A Scheme for Dairy Cattle Improvement in Great Britain, by J. Edwards (pp. 15–20); Genetics as a Means of Improving the Milk-producing Breeds of Cattle and Sheep, by Mauch (pp. 21–27); Ensilage of Green Fodder in Belgium: Influence of Silage on the Quality of the Milk and of the Derived Products, by F. Smeyers (pp. 29–32); On the Influence of Soya Bean Meal and Some Mixtures of Concentrated Feeds on the Iodine Content of Butter When They Are Used in Small Quantities Together with Fodder the Basis of Which Is Straw and Oats, by I. Poijarvi (pp. 33–37); Studies on Dehydrated versus Sun-cured Hays for Dairy Calves and Heifers, by S. I. Bechdel and A. A. Borland (pp. 39–44); Application of the Principles of Genetics and of the Improvement of Breeds to Cows and to Milk-producing Sheep, by H. Doehner (pp. 45–48); Improvement of Milk Yields by Cross-breeding, by R. W. Littlewood (pp. 49–52); A Study of the Phosphorus Requirement of Dairy Cattle When Alfalfa Hay Furnishes the Principal Source of Protein, by C. F. Huffman (pp. 53–55); The Condition of the Milk of Cows on Alpine Pasture, by A. Staffe (pp. 57–67); The A. I. V. Fodder, by A. [I.] Virtanen (pp. 69–77); The Biological Values of the Proteins of Certain Concentrates for Milk Production, by S. Morris and N. C. Wright (pp. 79–85); Some Specific Influences of Fodder Silage, by E. Brouwer (pp. 87–93); Contribution to the Question of the Sexual Limitation of the Inheritance of Milk Yield and Yield of Butterfat in Cattle, by J. Taufer (pp. 95–101); Results of Selection for Milk Yield in Hungary, by P. Von Batta (pp. 103–108); Investigations on the Harmfulness of Marsh Horse-tail (*Equisetum palustre*) on Dairy Cattle and the Measures to Combat It, by Buenger and Glet (pp. 109–114); The Influence of Silage on the Quality of Milk and Milk Products, by C. Gorini (pp. 115–119); The Influence of Feeding on the Quality of the Milk and of the Derived Products, by H. Ferrut and C. Siloret (pp. 121–131); The Ensilage of Green Fodder, by H. Lepetit (pp. 133–135); Feeding of Controlled Cows in Hungary during the Period 1929–1932, by A. Zaitschek (pp. 137–144); The Effect of the Addition of Whey to Grass Silage on the Subsequent Bacteriological and Chemical Changes, by L. A. Allen and S. J. Watson (pp. 145–154); The Correlation of Milk-Yield, Fat-Percentage, and Butter-Fat Production and Their Consequences for the Testing and Breeding of the Dairy-Cattle, by J. Krizenecky (pp. 155–161); Is Mouldy Milk Attributable to the Cow? (pp. 163–171) and Biometrics in the Dairy Industry (pp. 173–180), both by A. Janoschek; and On Genetics and Practical Selection for the Breeding of the Physiological Qualities Manifested by the Milk Yield, by L. Kruger (pp. 181–187).

Hygiene, chemistry, and bacteriology of milk and dairy products as human food.—Contribution to the Knowledge of the Catalytic Oxydisation of the Butterfat in Milk, by S. Kende (pp. 1–11); The Significance of Simple Methods in Dairy Bacteriology, by R. Burri (pp. 13–21); Some New Contributions Regarding the Significance of the Acidoproteolytes in Cheese Ripening, by C. Gorini (pp. 23–31); The

Bacteria in Milk in the High Mountains, by A. Staffe (pp. 33–39); Merino-Sheep's Milk: Its Quantity and Quality, by J. Schandel (pp. 41–44); The Influence Exercised by a Close Numerical Relation between Cows and Milkers on the Quantitative, Qualitative, and Hygienic Production of Milk, by M. Guardasoni (pp. 45–52); A Study of the Persistence of the Escherichia-Aerobacter Group in Cold Stored Sweet Cream Salted Butter, by M. Grimes and A. J. Hennerty (pp. 53, 54); Practical Experiments on the Taste of Tallow in Milk and Its Derived Products, by G. Majer (pp. 55–58); Two New Methods for the Determination of the Natrium Hydrocarbonate in Milk, by B. Hunkar (pp. 59–61); Contributions to the Acidity of the Butter, by E. Pijanowski (pp. 63–69); Study of the Unknown Reducing Substances Capable of Causing Reduction in Milk and Their Influence on the Quality of the Milk and of Its Derived Products, by S. Kende (pp. 71–79); Results of Experimental Investigations on the Problem of Fighting Inability to Produce Milk, by W. Steck (pp. 81–86); The Question of the Lactoses in Milk, by Polonovski (pp. 87–94); The Action of Cream and Butterfat on Metals and the Influence of Metals on the Quality of Butter and Clarified Butter, by W. Mohr and A. Eichstaedt (pp. 95–100); On the Control of Pasteurised Milk in the Town Based Particularly on the Bacteriological Point of View, by E. Stroeszner (pp. 101–106); The Indispensability of Stroke Cultures for Research on the Bacteriology of Milk, by Henneberg (pp. 107–109); Corrosive Effect on Metal of Certain Cleansing and Disinfecting Agents Important in the Dairying Industry, by W. Mohr and R. Kramer (pp. 111–114); Compulsory Pasteurisation of Mixed Milk Intended for Consumption as Fresh Milk, by M. Foussier (pp. 115–125); The Correction of the Degree of Acidity, a Capital Fault in the Determination of the Lowering of the Freezing Point of Milk, by J. Vukov (pp. 127–132); The Problem of Continuity in Butter-making, by V. Siric and M. Kazansky (pp. 133–139); Factors Affecting the Solubility of Milk Powders, by G. R. Howat and N. C. Wright (pp. 141–145); The Education of Milk Producers by Means of Clean Milk Competitions, by J. F. Blackshaw (pp. 147–152); On the Chemistry of Milk Formation, by W. Lintzel (pp. 153–159); The Significance of Thermoduric and Thermophile Bacteria in Sterilized, Pasteurized, and Raw Milk, by C. Gorini (pp. 161–164); The Upper Limit-Value of the Specific Gravity of Whole Milk, by E. Hanke (pp. 165–168); The Connection between the Copper Content of Milk and the Suety or Oily Flavour Noticeable in Milk, by J. Krenn (pp. 169–175); The World Clean Milk Competition, by E. Eber (pp. 177–181); Satisfactory Results So Far Obtained in the Conservation and Deacidification of Milk by Means of Electric Current, by W. Winkler (pp. 189–194); Hygiene in the Distribution of Milk in Large Towns, by A. Hocheleitner (pp. 195–198); The Action of Metals and Their Alloys on Whole Milk and of Whole Milk on Metals and Their Alloys, by W. Mohr, R. Kramer, A. Burr, and H. Osterburg (pp. 199–205); On the Reinfection of Milk in the Dairy, by J. Masek (pp. 207–209); Number of Coli Bacteria and Total Number of Germs in Consumption Milk at Bucarest, by Odainsky and Baies (pp. 211–216); The Most Probable Relations Existing between the Quantity of Solids, the Butterfat Content, and the Specific Weight of Milk, by D. C. Waal (pp. 217–223); The Investigation of Kumiss from the Bacteriological Point of View, by A. Voytkievich (pp. 229–231); Corrosive Effect of Various Cooling Salts on Metals, by W. Mohr and R. Kramer (pp. 239–246); The "Red Band" Disease in "Manchego" Cheese, by A. Santa Cruz (pp. 251–257); On the Correction of the Ph Found in Cream by Means of the Quinhydrone Electrode, by S. Knudsen and A. Sorensen (pp. 259–262); Investigations on Bad Spots in Emmental Cheeses, by W. Stocker (pp. 263–270); The Electro-Optical Determination of the Average Molecular Size Vd. of Milk Fat, by A. Schneck (pp. 277–279); Corrosive Effect of Cooling

Salts on Single Metals, by A. Burr and M. Miethke (pp. 281–286); Contribution to the Study of Lactic Fermentation, by E. Piraux (pp. 287–292); Inoculation of Pasteurised Consumption Milk with Acid-producers, by A. Herbert (pp. 293–299); Investigations on the Corrosion of Metals Important in the Dairying Industry by Acid Milk Products and in Rennet Whey, by W. Mohr, W. Muller, and W. Schroeter (pp. 301–306); The Influence of the Vessels on the Duration of the Coagulation of Milk with Rennet, by F. Springer (pp. 307–315); Cleaning and Treatment of Milk Bottles, by T. Dykes (pp. 317–321); Exact Lactic Acid Determinations in Ripe Cheese, by H. Hostettler (pp. 329–334); The Acceleration of the Ripening of Cheese, by A. Wojtkiewicz and G. Inikkoff (pp. 335–339); The Water Content of Butter in Various Stages of Production, by L. F. Rosengren (pp. 341–345); The Decomposition of the Fat in Hard Cheeses, by O. Laxa (pp. 347–350); The Decomposition of the Albumen and the Concentration of Ions of Hydrogen by Certain Acid-proteolytes, by A. Janoschek and A. Underrain (pp. 351–357); Momentaneously-heated Milk and Peroxidase Indication, by A. Burr and M. Miethke (pp. 359–369); The Influence of Dairy Technique on the Consistency of Butter, by W. Mohr and F. Oldenburg (pp. 371–380); Applications of Aluminium in the Dairy Industry, by P. Campanaro (pp. 381–389); On the Movement and Methods for the Hygienic Production of Milk in Various Countries, by C. Gorini (pp. 391–401); Studies on the Ageing (Ripening) of the Milk Employed in the Manufacture of Cheese, by J. Hanusch (pp. 403–410); The Preparation of Kefir on Pure Cultures, by A. Voytkievich (pp. 411, 412); Investigations as to the Hardness of Butter, by G. Wode (pp. 413–422); The Practical Importance of Colimetric Research as a Check on the Working of Pasteurisation Plants, by M. Bertazzoni (pp. 423–429); Influence on the Gaseous Exchange in Respiration of Feeding with Milk from a Cow in Heat, by F. Usuelli (pp. 431–438); Effects of Corrosion on Refrigerating Machines, by O. Stueber (pp. 439–447); Requisites in Water for Dairy Use, by A. Burr and H. Doering (pp. 449–457); Some Causes of Variation in the Solids-Not-Fat Content of Milk, by S. Bartlett (pp. 465–472); The Adaptability of Milk to Pasteurisation and the Control of the Quantitative Efficiency (Index of Efficiency) of Industrial Pasteurisation, by A. Sala (pp. 473–479); On the Influence of Rennet on the Stability of Whipped Cream, by E. Wessely (pp. 481–488); On the Problem of Determining the Mean Number of Microorganisms per Unit of Volume, by T. Matuszewski, J. Neyman, and J. Supinska (pp. 489–493); Value of the Xylol Index for Certain Belgian Butters: Variations in the Value of the Principal Butter Indices with Conservation, by C. Keymeulen (pp. 495–499); The Extinction Coefficient Kf as an Individual Milk Constant, by A. Schneck (pp. 501–503); The Catalysis Test and Its Utility in the Biological Determination of Butter Quality, by K. J. Demeter and H. O. Christiansen (pp. 505–510); Method of Obtaining a Milk Rich in Vitamin D by Means of an Artificial Preparation of this Vitamin, by O. Wellmann (pp. 511–517); The Influence of Refrigeration on the Conservation of Butter, by Orla-Jensen and N. C. Otte (pp. 519–529); The Nature and Properties of the Lead Serum of Milk and Its Use in Refraction Examination of Milk, by S. Rothenfusser (pp. 531–539); Germ Infection from Austrian and Foreign Woods Used for the Preparation of Butter Churn and Kneaders, by H. Marschall (pp. 541–545); and Contribution to the Study of Acid-Producers, by J. Rumment (pp. 561–567).

Industrial utilisation and commerce of milk and of dairy products.—The Manufacture of Cheese with Pasteurised Milk, by P. Mazzé (pp. 1, 2); The Acidoproteolytes in the Pasteurization of Milk for the Manufacture of Soft Cheeses of "Bel Paese" Type, by C. Gorini (pp: 7–9); The Pasteurization of Milk for the Manufacture of Emmental Cheese, by H. Fruhwald (pp. 39–

45); On Certain Technical and Bacteriological Experiments in the Production of Hard Cheeses from Heated Milk, by K. Zeller, K. J. Demeter, and H. O. Christiansen (pp. 63–65); Some Experience in Connection with the Making of Gouda and Edam Cheese from Pasteurized Milk, in Frisian Dairy Factories, by F. Keestra (pp. 73–80); Roquefort Cheese, by M. Freychet (pp. 81–86); The Pasteurization of Milk for the Manufacture of Tilsiter Cheese, by H. Fruehwald (pp. 87–90); The Manufacture and Sale of Butter and Cheese Mixed with Margarine, by A. Santa Cruz (pp. 91, 92); Production of Cheese by the Emmental Method from Partly Heated Milk, by J. Klang (pp. 93–97); Tiroler Grey Cheese, Its Nature and Manufacture, by J. Pregenzer (pp. 99–104); Experiments in the Wrapping of Butter in Metal Foil, by M. Schaeffler (pp. 105–108); The Problem of Utilizing Preservatives in the Production of Preserved Melted Cheese, by O. Gratz (pp. 109–111); The Rational Utilisation of Cheesemaking Serums (Whey) in Pig-breeding, by M. Leroy (pp. 123–128); The Influence of Various Methods of Milk, Particularly of Short-period Heating on the Behaviour of Heating Heated Milk in the Manufacture of Camembert Cheese, by F. Kieferle (pp. 129–135); Quargel, an Austrian Cheese Manufactured from Sour Milk, by L. Meyer (pp. 137–142); The Production of Skimmed Milk for the Manufacture of Acid Cheeses in Czechoslovakia, by J. Dvorak (pp. 157–160); Pasteurised Milk for Calves, by A. C. McCandlish and A. N. Blackw (pp. 183–188); Experiments in the Utilization of Whey from Cheese Factories as Fodder, Particularly for Swine, by Buenger (pp. 189–193); Improvement of Collected Cream by Washing and Centrifugalling, by Riedel (pp. 195–198); and High Temperature Short Time Pasteurisation, by A. T. R. Mattick and E. N. Hiscox (pp. 199–210).

Teaching, experimentation, and propaganda concerning milk and dairy products.—The Influence of Traction Work on the Secretion and Composition of the Milk of Cows, by J. Taufer (pp. 1–7); The Value of Separated Milk during the Growth Period of Animals, by H. Isaachsen (pp. 39–44); The Use of Aluminium in the Cheesemaking Industry, by M. Bonin (pp. 45–47); Progress in Milk Testing, by J. Golding (pp. 57–60); Studies with Soft-Curd Milk, by F. J. Doan and R. C. Welch (pp. 67–72); A Process for Automatically Recording Milk Creaming, by A. Schneck (pp. 79–84); The Persistency of Lactation as Affected by the Frequency of Milking, by W. J. Hansen and N. R. Joshi (pp. 85–90); Efforts to Change the Formation of the Holes in Emmental Cheese by Departing from the Usual Methods of Manufacture, by J. Pregenzer (pp. 97–104); Cows Milked to the End and Their Milk, by W. Schliempflug (pp. 105–117); and Comparative Researches on the Different Methods for the Conservation of Butter, by H. Brunner (pp. 119–125).

Legislation and control of milk and dairy products.—The Influence of the Length of the Intervals between the Milkings on the Secretion of Milk and on Its Butterfat Content, by J. Groh (pp. 15–21); and Study on the Comparative Value of the Methods Proposed for the Bacteriological Control of Milk, by R. Bozzelli (pp. 119–127).

Tropical dairy.—The Manufacture of Butter under Tropical Conditions in Kenya Colony, by D. E. Hartley (pp. 5–11); On the Influence of Papayotin on Milk, by A. Underrain (pp. 35–43); A Short Note on the Problem of Milk Preservation in Tropical Countries, by J. V. Takle (pp. 45–47); The Annamite Cow: Its Type, Its Qualities and Defects, Its Improvement, by J. Lieux (pp. 73–77); The Indian Buffalo as a Milch Animal Suitable for Tropical Countries, by Z. R. Kothavala (pp. 91–102); The Improvement of the Milk Yields of Native or Local Breeds by Crossing or Selection: Introduction and Acclimatisation of Good Breeds of Cattle Giving a High Yield of Milk, by W. D. D. Jardine (pp. 103–109); Improvement of Milk Yields of Native and Local

Breeds by Crossing or by Selection: Introduction and Acclimatisation of Good Breeds of Cattle Giving a High Yield of Milk, by T. D. Marsh (pp. 111–113); The Ghee Problem in the United Provinces, India, by C. Maya Das (pp. 115–119); and Improvement of Pasturage of Tropical Countries with Special Reference to Conditions in Malaya, by T. D. Marsh (pp. 121–128).

[Investigations with dairy cattle and dairy products at the Illinois Station] (*Illinois Sta. Rpt. 1934, pp. 124–136, figs. 6*).—Data accumulated in studies with dairy cattle are reported on the effect of frequency of milking on production, by W. W. Yapp and J. G. Cash; age-correction factor for different breeds, by W. L. Gaines; and lespedeza straw as a feed for dairy cattle, by W. B. Nevens.

With dairy products, results were obtained in studies on effect of various factors on the quality of ice cream, by P. H. Tracy, H. A. Ruehe, S. L. Tuckey, and R. J. Ramsey; factors causing poor whipping of cream, by Tracy and Ramsey; improved methods for analysis of milk color, by Yapp and A. F. Kuhlman; comparison of chemical sterilizers for dairy use, by M. J. Prucha; maintaining quality standards in small milk plants, by J. M. Brannon and Prucha; and increasing dairy products consumption by maintaining high quality, by Brannon, Prucha, Ruehe, and Tracy.

[Investigations with dairy cattle and dairy products by the Wisconsin Station] (*Wisconsin Sta. Bul. 430 (1935), pp. 84–91, 100, 101, 113–116, 131–135, fig. 1*).—Investigations with dairy cattle produced results on the feasibility of ensiling alfalfa by the A. I. V. method, by G. Bohstedt, W. M. Beeson, I. W. Rupel, E. B. Hart, H. Steenbock, W. H. Peterson, H. R. Bird, and E. B. Fred; the value of milk from A. I. V. silage as a promoter of growth, by Rupel, C. A. Elvehjem, Hart, W. H. Uphoff, Steenbock, and Beeson; the differences in the vitamin A and carotene content of milk among different breeds of cattle, by C. A. Bauman, Steenbock, Beeson, and Rupel; the amount of vitamin A and carotene in colostrum milk, by J. Semb, Bauman, and Steenbock; and the feeding of vitamin A to pregnant or lactating animals as a method of supplying it to the young, by Steenbock, Bauman, and B. M. Riising.

With dairy products information was obtained on the production of Swiss cheese of low fat content, by G. C. North and W. V. Price; the role of bacterial cultures in Swiss cheese making, by A. B. Erekson and E. G. Hastings; predicting cheese quality by tests made during the making processes, by Price, M. B. Semb, and L. W. Brown; causes for differences in the measurements of moisture in cheese, by Price and B. Baker; development of successful commercial milk irradiation apparatus, by K. G. Weckel and H. C. Jackson; prevention of sediment in homogenized milk, by H. H. Sommer and D. A. Charles; determining the prevalence of abnormal milk in dairy herds, by R. Monroe and Price; and the limited use of the methylene blue test in milk containing few bacteria, by M. Thauer and Hastings.

Estimating live weights of dairy cattle, A. C. Ragsdale and S. Brody (*Missouri Sta. Bul. 354 (1935), pp. 9*).—A previous bulletin (E. S. R., 73, p. 674) explained how the efficiency of the dairy cow could be computed if milk production and live weight were known. Since scales are not often available, records of the live weight of animals are not regularly kept, and this bulletin shows by tables show the live weight of dairy cattle of all ages may be computed by measuring the heart girth. These tables are based on correlations between weights and measurements from 4,513 sets of records.

Estimating condition in dairy cattle, S. Brody and A. C. Ragsdale (*Missouri Sta. Bul. 355 (1935), pp. 11, figs. 2*).—Continuing the above study, this bulletin presents a simple method for estimating the degree of overweight or underweight of animals from average weights. The estimates are made by measuring the height at withers and comparing the weight of the given animal with the corresponding weights in the tables given in the text.

Rye as a grain feed for dairy cattle, J. O. TRETSVEN (*Montana Sta. Bul. 303* (*1935*), *pp. 11*).—This bulletin reports the results of two feeding trials with dairy cows and two feeding trials with growing heifers in which the feeding value of rye was compared with that of hulled barley. A study was made also of the effect of fairly large amounts of rye in a well-balanced diet upon the quality of the dairy products produced.

It was found in these trials that a good grade of either spring or winter rye, making up 40 to 45 percent of the grain ration, had approximately the same feeding value for milk production as a good grade of hulled barley when fed with alfalfa hay. No difficulty was experienced in getting the cattle to eat the rye grain mixture, although the dairy mixture was somewhat more palatable. No detrimental effects in health or condition of the animals were observed when rye was fed. The quality of the milk and butter produced on the rye ration was fully equal to that produced on the dairy ration. For growing heifers ground rye and alfalfa hay produced as good gains as ground hulled barley and alfalfa hay. Because rye is a hardy, drought-resistant crop that can be grown in many parts of the State where other grain crops are not dependable and because it appears to be practically equal to barley in feeding value, it is recommended that dairy farmers should grow more rye for feeding purposes.

Skim milk foam: Its effect on dairy calves, J. O. TRETSVEN and E. KEYES (*Montana Sta. Bul. 304* (*1935*), *pp. 7*).—The results reported in this bulletin are based on answers made to a questionnaire by 74 practical dairymen and on the results of a feeding trial with two lots of Holstein calves and two lots of Jersey calves fed skim milk with and without foam.

Of the dairymen who answered the questionnaire, 37 percent were of the opinion that skim milk foam caused scouring, and 75 percent recommended removing the foam before feeding.

The feeding tests indicated that calves may be fed skim milk with foam in proper amounts and otherwise adequately fed and cared for so that they will grow as rapidly and be as healthy as calves fed in a like manner with the foam removed. While some calves appeared to be slightly bloated for a few minutes after feeding skim milk with foam, there were no bad after-effects. The feeding of large amounts of skim milk often caused scours and indigestion. There was no significant difference in the general appearance of calves fed skim milk with and without foam. It was difficult to determine the amount of milk fed unless the foam was removed.

The relation between the vitamin A content of the dairy ration and of milk, W. C. RUSSELL, M. W. TAYLOR, D. F. CHICHESTER, and L. T. WILSON (*New Jersey Stas. Bul. 592* (*1935*), *pp. 11*).—Using two lots of 15 cows each, this study was undertaken to determine the vitamin A potency of milk produced by animals fed machine-dried alfalfa and those fed alfalfa which had been field cured in the high altitudes of the western States. The vitamin A potency of the other factors in the ration—yellow corn, corn gluten meal, and corn silage—were determined so that it was possible to calculate the percentage of vitamin A in the ration which appeared in the milk.

It was found that high-grade field-cured alfalfa or machine-dried alfalfa and corn silage contributed 98 percent of the vitamin A value of a ration which contained in addition beet pulp and a grain mixture made with yellow corn and corn gluten. The corn silage supplied from one-half to two-thirds of the vitamin A content of the ration.

With a daily vitamin A intake of the order of 900,000 to 1,200,000 U. S. P. X. 1934 units, the vitamin A potency of the milk produced by mixed breeds was of the order of 2,500 units per quart. In one instance the feeding of 950,000 units resulted in milk of 1,600 units' potency. In no case did the output of vitamin A in the milk exceed 3.5 percent of the intake of the vitamin. It was apparent that the percentage of this factor which appears in the milk decreases as the amount of the factor in the ration increases, and that an increase in the vitamin A content of the milk was not proportional to increased consumption.

VETERINARY MEDICINE

Agents of disease and host resistance, including the principles of immunology, bacteriology, mycology, protozoology, parasitology, and virus diseases, F. P. Gay et al. (*Springfield, Ill.: Charles C. Thomas, 1935, pp. XIII+1581, pls. [6], figs. [291]*).—The several parts of this work, prepared by the author assisted by 19 associates, deal with (1) general aspects of the causation, classification, and nature of disease (pp. 3–21), (2) inanimate disease agents and tolerance (pp. 22–119), (3) living disease agents, particularly bacteria—their morphology and physiology (pp. 120–247), (4) infection and epidemiology (pp. 248–288), (5) resistence and immunity (pp. 289–454), (6) pathogenic bacteria and diseases produced by them (pp. 455–1070), (7) pathogenic spirochetes and spirochetoses (pp. 1071–1108), (8) pathogenic fungi and fungus diseases (pp. 1109–1151), (9) indeterminate pathogenic forms and diseases produced by them (pp. 1152–1282), (10) animal pathogens (pp. 1283–1435), (11) diseases of obscure etiology (pp. 1436–1466), and (12) practical results in the diagnosis, prevention, and cure of infectious diseases (pp. 1467–1561).

Brief directions in histological technique, E. R. Becker and R. L. Roudabush (*Ames, Iowa: Collegiate Press, 1935, pp. IX+80*).—This is a practical guide presented in eight parts, with recommended references to special subjects and an index.

The health organisation and biological standardisation, R. Gautier (*League Nations Health Organ. Quart. Bul., 4 (1935), No. 3, pp. 497–554*).—The standardization of sera and bacterial products (pp. 504–521), of certain drugs (pp. 521–536), of vitamins (pp. 536–543), and of sex hormones (pp. 543–547) are reported upon.

Spinal (epidural) anaesthesia in the domestic animals: A review of our knowledge at the present time, G. B. Brook (*Vet. Rec., 15 (1935), Nos. 19, pp. 549–553, figs. 5; 20, pp. 576–581; 21, pp. 597–608, figs. 11; 22, pp. 631–635, figs. 5; 23, pp. 659–667, figs. 11*).—This is a review of the present knowledge of the subject presented with a 2-page list of references to the literature.

Selenium in soils in relation to its presence in vegetation, H. G. Byers and H. G. Knight (*Indus. and Engin. Chem., 27 (1935), No. 8, pp. 902–904, fig. 1*).—This contribution (E. S. R., 74, p. 102) considers the effect of plant species and soil composition, the effect of moisture in soil, and the distribution of selenium in the plant. It is shown that the quantity of selenium in vegetation grown upon a soil depends not alone upon the concentration but also upon a variety of other factors which include the plant species, the composition of the soil, the moisture relations in the soil, the stage of development of the plant, and the portion of the plant examined.

A veterinary history of North Carolina, W. Moore, L. J. Faulhaber, and J. H. Brown (*Tarboro, N. C.: N. C. State Vet. Med. Assoc., 1934, pp. [1]+54; rev. in Jour. Amer. Vet. Med. Assoc., 86 (1935), No. 1, pp. 99, 100*).—This historical account of work and workers in North Carolina includes a list of veterinarians.

[Report of work in animal pathology and parasitology by the Illinois Station] (*Illinois Sta. Rpt. 1934, pp. 85–88, 101, 102, 108–110, 111–113, 119–123,* *figs. 7*).—The work of the year referred to (E. S. R., 70, p. 674), by R. Graham, F. Thorp, Jr., J. P. Torrey, E. Roberts, W. E. Carroll, E. E. Slatter, V. M. Michael, E. H. Barger, and L. E. Card, relates to the demonstration of Bang's disease in many herds, experimental use of chaulmoogra oil in the treating of paratuberculosis or Johne's disease, inherited resistance of pigs to hog cholera, horse parasite elimination and control work, monthly flock testing in the control of pullorum disease, use of fresh vaccine in the control of laryngotracheitis of the fowl, inheritance of resistence to pullorum disease, and the value of pigeon pox vaccine in preventing chicken pox.

[Contributions on animal pathology] (*N. Y. State Vet. Col. Rpt., 1933–34, pp. 53–150, fig. 1*).—The contributions presented in this annual report, issued in 1935 (E. S. R., 71, p. 836), are as follows: A Contribution to the Chemical Study of Chicken Blood, by A. C. Gonzaga (pp. 53–57); Acetonemia and Acetonemia with Parturient Paresis (Atypical Milk Fever), by C. E. Hayden, M. G. Fincher, and J. Sampson (pp. 58–65) (E. S. R., 70, p. 831); A Method for Making Concentrated Calcium Gluconate Solutions, by C. E. Hayden (p. 66); The Pathogenicity, for Cattle, of *Brucella* Strains Isolated from Cases of Undulant Fever in Man, by R. R. Birch and H. L. Gilman (pp. 67–73) (E. S. R., 73, p. 102); The Elimination of *Brucella abortus* from the Feces of Calves Taking Infected Milk, by A. F. Ranney (pp. 74–81) (E S. R., 72, p. 384); The Influence of Nutritive Conditions on Acid-Fastness of Bacteria (pp. 82–96) and Differentiation between Gram-Positive and Gram-Negative Micro organisms by the Use of Enzymes (pp. 97–104), both by D. W. Bruner; Studies on the Viability of *Eimeria tenella* in Soil, by F. D. Patterson (pp. 105–119) (E. S. R., 70, p. 100); Some Case Reports on Pyometra in Bitches, by H. C. Stephenson and H. J. Milks (pp. 120–124); Eczema, by H. J. Milks (pp. 125–131); and Allergy and Allergic Skin Reactions in the Dog, by B. S. Pomeroy (pp. 132–150).

[Controlling animal diseases in Wisconsin] (*Wisconsin Sta. Bul. 430 (1935), pp. 92–100, fig. 1*).—The work of the year referred to (E. S. R., 72, p. 528) includes testing and culling in securing and maintaining dairy herds reasonably free from mastitis, by F. B. Hadley; resistance of cattle to Bang's disease, by B. A. Beach; bactericidal properties of the blood of cattle during infection with *Brucella abortus*, by M. R. Irwin; the influence of extra calcium in the ration in increasing susceptibility of chickens to coccidiosis, by C. A. Herrick, G. L. Ott, J. G. Halpin, and C. E. Holmes; the importance of bacillary white diarrhea of chickens, by Halpin, Holmes, and Beach; and avian tubercle bacilli complication in the eradication of bovine and hog tuberculosis, by E. G. Hastings and J. McCarter.

[Reports of the veterinary director general for the years ended March 31, 1934 and 1935], G. HILTON ET AL. (*Canada Dept. Agr., Rpts. Vet. Dir. Gen., 1934, pp. 59; 1935, pp. 77*).—These reports (E. S. R., 70, p. 675) contain accounts of work with contagious diseases by A. E. Cameron (pp. 11–32 and 7–28) and of pathological work by E. A. Watson (pp. 40–56 and 36–44).

The 1935 report also contains two appendixes, namely, Swine Fever Studies, together with a Note on Acute Swine Diseases, by C. A. Mitchell, R. V. L. Walker, and F. A. Humphreys (pp. 44–67), and An Outbreak of Glanders of Low Pathogenicity, by C. A. Mitchell, J. C. Reid, and R. V. L. Walker (pp. 67–73).

[Contributions on animal pathology] (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 5 (1935), No. 1, pp. 5–174, 273–303, figs. 43*).—The contributions presented relating to animal pathology (E. S. R., 74, p. 254) are as follows: The Transmission of *Spirochaeta theileri* to a Blesbuck (*Damaliscus albifrons*) (p. 7) and Bovine Anaplasmosis: The Transmission of *Anaplasma marginale* to a Black-Wildebeest (*Connochaetes gnu*) (pp. 9–11), both by W. O.

Neitz; The Transmission of Louping Ill by Ticks (*Rhipicephalus appendiculatus*), by R. A. Alexander and W. O. Neitz (pp. 15–33); The Blesbuck (*Damaliscus albifrons*) and the Black-Wildebeest (*Connochaetes gnu*) as Carriers of Heartwater, by W. O. Neitz (pp. 35–40); On Some Helminths from the "Nylghiae"—*Boselaphus tragocamelus* (Pall.), with Observations on the Parasitic Larval Stages of the Stomach Worm *Ashworthius martinagliai* sp. n. (pp. 43–50) and On the Metacercaria and Adult of *Clinostomum van der horsti* sp. n., a Trematode Parasite of Fishes and Herons (pp. 51–58), both by R. J. Ortlepp; The Lethal Dose of the Toxins of Some Anaerobes for Sheep, by J. H. Mason (pp. 61–64); The Antigenic Components of the Toxins of *Cl[ostridium] botulinum* Types C and D, by J. H. Mason and E. M. Robinson, (pp. 65–75); Note upon the Isolation of the Toxic Principle from a Species of *Dimorphotheca*, Probably *Dimorphotheca fruticosa*, by C. Rimington and D. G. Steyn (pp. 79, 80); Chemical Investigations of the "Gifblaar" *Dichapetalum cymosum* (Hook) Engl. I, by C. Rimington (pp. 81–95); Hydrocyanic Acid in Grasses, by A. C. Léemann (pp. 97–136); The Detection of Strychnine in Carcasses and Corpses, by D. G. Steyn (pp. 139–174); and The Operation of Splenectomy in Horses, Cattle, Sheep, Goats, Pigs, Dogs, and Some South African Antelopes: A Summary of the Results of 98 Splenectomies, by J. Quinlan, G. de Kock, and I. P. Marais (pp. 273–303).

Annual report of the veterinary department for the year 1934, W. W. Henderson et al. (*Nigeria Vet. Dept. Ann. Rpt., 1934, pp. 32*).—Included in this report is an account of the occurrence of and control work with infectious diseases.

Annual report of the department of veterinary science and animal husbandry, 1934, H. E. Hornby et al. (*Tanganyika Dept. Vet. Sci. and Anim. Husb. Ann. Rpt., 1934, pp. 130, pls. 7, figs. 13*).—Included in this report (E. S. R., 72, p. 529) is an account of the occurrence of and control work with infectious diseases, parasites, and plant poisoning during the year.

Annual report of the veterinary department for the year ended 31st December 1934, W. F. Poulton et al. (*Uganda Vet. Dept. Ann. Rpt., 1934, pp. 36, pls. 3*).—A report is made on the occurrence of and control work with infectious diseases of livestock (E. S. R., 72, p. 382), including the *Glossina morsitans* investigation and reclamation.

[Contributions on diseases and parasites of livestock] (*Far East. Assoc. Trop. Med., Trans. 9. Cong., Nanking, China, 1934, vols. 1, pp. 259–269, 601–604; 2, pp. 305–323, 557–562, 571–580, figs. 3*).—The contributions presented at the ninth congress of the Far Eastern Association of Tropical Medicine held at Nanking, China, in October 1934 include the following: Studies on the Virus of Pleuro-pneumonia of Cattle, by F. F. Tang, H. Wei, D. L. McWhirter, and J. Edgar (pp. 259–261); Recent Advances in the Study of Immunity in Virus Diseases: A Review, by S. H. Zia (pp. 263–269); On the Active Immunization of Animals against Tape Worms, by T. Ohira (pp. 601–604); Some Diseases Common to Man and Animals in China, by H. S. Gear and H. Pedersen (pp. 305–323); On the Distribution of Parasites and Parasitic Diseases in Manchuria, by K. Hiyeda (pp. 557–562); and Single Cell Transmission of Surra, by T. Topacio (pp. 571–580).

The specificness of the negative phase in precipitin production, L. Hektoen and W. H. Welker (*Jour. Infect. Diseases, 57 (1935), No. 3, pp. 337–344*).—The studies reported indicate that the negative phase in precipitin formation is specific. "In the rabbits immunized with a single antigen the injection of heterologous antigens has not reduced the precipitin content of the blood. In the rabbit immunized against many antigens, the injection of one of the antigens as the rule resulted in the disappearance from the blood of the precipitin for that antigen only. These results indicate that in the rabbit different precipitins exist as separate entities."

The ultraviolet light of the quartz lamp as a prophylactic factor in the struggle against ascariasis.—Preliminary report [trans. title], M. M. Zavadovskiĭ (Zawadowsky) and E. Vorob'eva (E. I. Vorobieva) (*Trudy Din. Razv. [Moskva] (Trans. Dyn. Devlpmt.), 9 (1935), pp. 331–340, figs. 6; Eng. abs., p. 340*).—It was found that the eggs of *Ascaris suilla, A. megalocephala, Strongylus equinus*, and other roundworms are readily destroyed by ultraviolet light.

Complement-fixation in blastomycosis, D. S. Martin (*Jour. Infect. Diseases, 57 (1935), No. 3, pp. 291–295*).—A description is given of a simple complement fixation test in blastomycosis of the American type, due to *Blastomyces dermatitidis*.

Testing and culturing for Brucella abortus, the microorganism that causes Bang's disease or infectious abortion, H. A. Ruehe (*Milk Plant Mo., 24 (1935), No. 9, pp. 44–46*).—A practical account.

Diagnosis and control of Bang's abortion disease in Friesland [trans. title], A. H. Veenbaas (*Tijdschr. Diergeneesk., 62 (1935), No. 20, pp. 1077–1084; Eng. abs., pp. 1082–1084*).—The work undertaken in Friesland during the last 20 yr. is reported upon. The article also includes a discussion of methods of cultivation and differentiation of the *Brucella* types, channels of infection, methods of diagnosis, prophylaxis, therapy, control measures, and State regulations.

Experimental infection in man and swine with Ascaris lumbricoides [trans. title], E. de Boer (*Tijdschr. Diergeneesk., 62 (1935), No. 18, pp. 965–973; Ger., Eng., Fr. abs., pp. 972, 973*).—In repeated experimental infections with eggs of *A. lumbricoides* from pigs as well as from man, the author succeeded in producing adult ascarids in the intestines of young pigs. It was found that resistance to experimental infections was not affected by vitamin A deficiency. Spontaneous infection in natural conditions, like experimental infection, did not always lead to the development of ascarids. The time required for the cycle of development from embryonated egg until adult, mature worm is about 2 mo. The resistance of pigs to infection with *Ascaris* can be divided into three forms, namely, a natural, an acquired, and a so-called "age resistance." The latter is probably of no importance. The acquired resistance depends on the presence of adult ascarids. In the intestines of earthworms (*Lumbricus terrestris*) which were present in infected soil the author found many *Ascaris* eggs. It is suggested that earthworms may play a part in the infection with *Ascaris*.

Studies on infection by and resistance to the Preisz-Nocard bacillus.—IV, Notes on the toxin, the pyogenic action, and the lipoid content of the bacillus, L. B. Bull and C. G. Dickinson (*Aust. Vet. Jour., 11 (1935). No. 4, pp. 126–138*).—A continuation of the work with *Corynebacterium pseudotuberculosis* (E. S. R., 70, p. 384).

Pleuro-pneumonia contagiosa bovum: The staining of the causal organism in the specific lesions, A. W. Turner (*Aust. Jour. Expt. Biol. and Med. Sci., 13 (1935), No. 3, pp. 149–155, figs. 8*).—The author finds the organism of pleuropneumonia contagiosa bovum to be readily demonstrated in sections of pathological tissues by a variety of staining methods, provided it is suitably fixed. Formol-saline, formol-Müller, or Regaud are absolutely contra-indicated. Suitable fixatives are the mercuric-chloride group (especially Zenker), Bouin (picroformolacetic), absolute alcohol, and Carnoy. The recommended technic for routine purposes is fixation in Bouin's solution followed by the staining of paraffin sections by Mallory's phosphotungstic acid-hematoxylin. The organism is present in infected lungs mostly in the relatively enormous mycelial phase.

It is considered that its easy demonstration in extracellular situations is another reason for its exclusion from the filtrable viruses sensu stricto.

Rabies (hydrophobia) (*Union So. Africa [Depts. Pub. Health and Agr. and Forestry] Bul. 150 (1935), pp. 20, figs. 4*).—A practical account of the occurrence and nature of and preventive measures for this disease, particularly among carnivorous animals (especially the yellow mongoose (*Cynictus penicillata*)), in the Union of South Africa.

Glycerinated rinderpest vaccine stored at room temperature, T. Topacio (*Philippine Jour. Sci., 57 (1935), No. 4, pp. 427–433*).—A description is given of a glycerinated rinderpest vaccine capable of storage at local room temperature. "The vaccine is of high immunizing value as shown by the fact that 86.2 percent of all the animals vaccinated resisted successfully the test dose of virulent blood. The chief advantage of this vaccine lies in the rapidity of its preparation and its keeping quality at local room temperature (20° to 30° C.). There is evidence that with better care in technic this vaccine can be rendered bacteria-free 1 mo. after preparation, since in four series it was found to be sterile within this period even with the ordinary aseptic methods of handling the materials."

Studies on the B. C. G.—First report, K. Yanagisawa (*Japan. Jour. Expt. Med., 13 (1935), No. 5, pp. 591–600, figs. 3*).—The studies reported, the details of which are given in table and chart form, led to the conclusion that while B. C. G. vaccine "causes some tubercular changes at the injected site and the regional lymph nodes of guinea pigs, these changes are progressive, but benign to be able to discover after a few weeks. Any tubercular change could not be found macroscopically when the B. C. G. dose under 1 mg was injected. The prophylactic effect is remarkable, but the therapeutic effect is much slighter than the prophylactic effect. The injection with the B. C. G. after the tubercular infection, however, would never make the tubercular changes worse."

On the presence of typhus virus in wild rats in New York City, C. Nigg (*Jour. Infect. Diseases, 57 (1935), No. 3, pp. 252–254*).—Although typhus virus was not actually recovered from wild rats obtained from the metropolitan area of New York City (for the most part from the neighborhood of wharves), during the months of September to December inclusive, the finding of what appeared to be a more or less marked immunizing effect following the injection of brain from rats which showed weak Weil-Felix reactions may possibly indicate previous typhus infection in them.

Immunization against virus diseases with tissue vaccine, W. H. Boynton (*Jour. Amer. Vet. Med. Assoc., 87 (1935), No. 6, pp. 650–658*).—In this discussion the author calls particular attention to the fact that the simultaneous method of immunization against virus diseases produces a superior type of immunity. The tissue vaccine is limited in that it provides a less adequate immunity and has no therapeutic properties; it is infinitely safer, since it eliminates unmodified virus from the field and renders negligible the dangers of giving rise to secondary complications. Such a vaccine should safely control losses from virus infections and assist in eradicating virus scourges.

Continued investigations of abortus infection in the udder of the cow [trans. title], H. O. Pedersen (*Skand. Vet. Tidskr., 25 (1935), No. 9, pp. 565–593, pls. 6, fig. 1; Eng. abs., p. 592*).—The investigations reported (E. S. R., 72, p. 532) have shown that *Brucella abortus* produces a chronic, infiltrative, and productive inflammation in the udder of the cow. "In a number of cases the inflammation leads to inflammatory alterations in the udder tissue which are observable macroscopically, but, as a rule, the inflammation is not observable until the histological investigation of the udder is carried out. Even if the inflammation only exceptionally has such a highly exudative character that the udder secretion displays typical alterations produced by inflammation of the udder, still these alterations lead, in many instances, to a diminished production of milk from the infected udder quarters."

Observations on Bang's disease in a large dairy herd under three different systems of control, C. F. SCHLOTTHAUER (*North Amer. Vet., 16 (1935), No. 6, pp. 27–31*).—Observations of a large herd in which the course of Bang's disease was studied over a period of 11 yr. under three different systems of control are reported. During the first 5 yr. infected and noninfected animals were maintained in contact, in the sixth year rigid segregation was practiced, and in the following 5 yr. complete eradication was attempted by disposing of all reactor cattle of breeding age.

The distribution of Br. abortus in the system of "carrier" cows, T. M. DOYLE (*Jour. Compar. Path. and Ther., 48 (1935), No. 3, pp. 192–217*).—In the course of the studies reported the tissues of 32 naturally infected cows were examined for the presence of *Brucella abortus*.

"The organism has been isolated from 13 different sites in 26 cows; 8 of the sites consisted of lymphoid tissue. *B. abortus* was isolated from the iliac glands in 52 percent and from the pharyngeal lymphatic glands in 28 percent of the cows examined. In view of the high percentage of infection in the iliac glands and their close relationship to the uterus, it appears reasonable to regard them as predilection sites of *B. abortus* in carrier cows. The strains of *Brucella* isolated were subjected to the usual identification tests and proved to be typical *B. abortus* types. The results obtained from the inoculation of guinea pigs with milk indicate that there is little correlation between the serological titer of the milk and the presence of the organism in it. *B. abortus* was isolated from 63 percent of guinea pigs inoculated with known infected material."

Actinomycosis (lump jaw, big jaw, and wooden tongue) in cattle, J. W. CONNAWAY and A. W. UREN (*Missouri Sta. Bul. 357 (1935), pp. 16, figs. 9*).—A practical summary of information on this disease of cattle.

A new coccidian from the bovine, Eimeria thianethi [trans. title], J. GWÉLÉSSIANY (*Ann. Parasitol. Humaine et Compar., 13 (1935), No. 4, pp. 338–341, fig. 1*).—A new coccidian met with in bovines in a mountain district of Georgia, U. S. S. R., described as *E thianethi*, is differentiated from *E. zürni*, *E. smithi*, *E. ellipsoidalis*, and *E. bukidnonensis*.

Staphylococci associated with mastitis, R. B. LITTLE and E. J. FOLEY (*Jour. Amer. Vet. Med. Assoc., 87 (1935), No. 6, pp. 637–649, figs. 5*).—The results of a study of the cultural reactions of 20 strains of pathogenic and saprophytic staphylococci are reported in detail in a table. It is shown that certain staphylococci isolated from milk secretions of normal udders, from fatal cases of mastitis, and from superficial abscesses of the skin of the udder comprise a definite group possessing common characteristics. Freshly isolated strains were found pathogenic for mice, and mastitis was produced in a cow by small numbers of organisms from a culture obtained from a skin abscess.

An unnoted hemolytic streptococcus associated with milk products, J. M. SHERMAN and H. U. WING (*Jour. Dairy Sci., 18 (1935), No. 10, pp. 657–660*).—Under the name *Streptococcus hemothermophilus* a description is given of a form believed to represent a new species. This organism differs from the pathogenic species of hemolytic streptococci in its higher maximum temperature of growth, a lower minimum temperature of growth, a higher thermal death point, and a more acid limiting pH of growth. It also differs from the human types in the hydrolysis of sodium hippurate and its failure to ferment sucrose.

The cattle tick pest in the Philippines—its control and eradication, Z. de Jesus (*Philippine Jour. Anim. Indus., 2 (1935), No. 4, pp. 263–283, pls. 2, figs. 3*).—In this practical account, presented with a list of 13 references to the literature, it is pointed out that in the Philippines a pasture can be freed from ticks (*Boophilus australis* Fuller) by vacating it for at least 120 days or 4 mo., in which case the seed ticks die of starvation.

Border pining in sheep, I, W. L. Stewart and S. E. Piercy (*Jour. Compar. Path. and Ther., 48 (1935), No. 3, pp. 157–191*).—This contribution, the details of which are presented at length in tables, relates to a disease referred to as "Northumbrian pining" and defined as a chronic, wasting disease of hill sheep, characterized by anemia and emaciation. A list is given of 28 references to the literature.

Preliminary investigation of a disease of sheep possessing certain characteristics simulating Johne's disease, G. W. Dunkin and S. E. B. Balfour-Jones (*Jour. Compar. Path. and Ther., 48 (1935), No. 3, pp. 236–240*).—A description is given of a disease of sheep presenting factors resembling Johne's disease of cattle, in which an acidfast organism isolated from the mucous membrane of the intestine of affected sheep was isolated and cultivated in pure culture. Points of difference between the condition described and Johne's disease of cattle are referred to.

Parasitic gastritis: The causes underlying its development in sheep, E. L. Taylor (*Jour. Min. Agr. [Gt. Brit.], 42 (1935), No. 7, pp. 647–657*).—It is pointed out that the factors governing the increase of parasitic worms to disease-producing number fall into three categories: (1) The productivity of the eggs of the parasite (i. e., the proportion of the parasites' eggs that reach the infective stage on the ground), (2) the transmissibility of the infective larvae (i. e., the proportion of the infective larvae picked up by the sheep), and (3) the susceptibility of the sheep (i. e., the proportion of infective larvae reaching the sheep's stomach that ultimately develop to maturity).

The control of parasitic gastritis and enteritis in sheep by treatment with copper sulphate and nicotine sulphate, A. D. McEwen (*Jour. Compar. Path. and Ther., 48 (1935), No. 3, pp. 218–235, figs. 4*).—The author has found that the more serious effects of nematode worm infestations of sheep and lambs grazing on permanent pasture in England can be prevented by the repeated administration of large doses of a 5 percent solution of copper sulfate containing 5 percent of a 40 percent solution of nicotine sulfate.

Distribution of nematodes in the small intestine of the sheep, J. H. Tetley (*Nature [London], 136 (1935), No. 3438, pp. 477, 478*).—It is pointed out that the jejunum is the favored region of infection of species of nematodes naturally occurring in sheep, and that those of any one genus share a common area, while species of different genera vary in the degree to which their infections overlap. In healthy sheep the species *Cooperia curticei*, *Nematodirus filicollis*, *N. spathiger*, *Strongyloides papillosus*, *Trichostrongylus colubriformis*, and *T. vitrinus* have each a normal frequency distribution which retains its identity throughout the period of infection.

"From the constancy of the form of distribution in sheep of various ages, under various conditions, at different times of the day, and at different seasons, it is concluded that: (1) Neither active nor passive migration on the part of adult worms takes place. (2) The site of infection is determined during the larval stage. (3) The stimuli causing larvae to take up their station are present in the contents of the small intestine, and arise in the duodenum at the point of entrance of the bile and pancreatic juice. (4) Specific differences in distribution are due to inherent dissimilarities in rates of reaction to the stimuli. (5) *Trichostrongylus* spp. respond to stimuli in the abomasum as well as in the jejunum. *T. axei* is sensitive to these, but *T. colubriformis* and *T. vitrinus* are less so, with the result that the populations of the latter two species become divided between the abomasum and the small intestine. Other species found in the small intestine in their passage through the abomasum apparently do not remain there long enough to enable stimuli to have effect upon them."

Tapeworm studies.—II, Persistence of the pasture stage of M. expansa, N. R. Stoll (*Amer. Jour. Hyg., 22* (*1935*), *No. 3, pp. 683–703, figs. 2*).—In continuation of the work previously noted (E. S. R., 73, p. 543), instances are detailed of the survival in the 1926–32 period of *Moniezia expansa* on an infested pasture under conditions when sheep were not present, or if present were not harboring the tapeworm and thus not seeding the area with eggs. "These instances include the well-defined Smith and Ring report [E. S. R., 58, p. 577] of 17½ mo., and a probable case of 22 mo., each of the latter periods spanning two winters. Climatic factors of two survival periods are detailed. An instance is analyzed of poor infectivity of the pasture during a period of drought. It is shown that no month of the year is excluded as an infective period. The bearing of the data on the eradication and life history problem of *Moniezia* is discussed."

A list of 13 references to the literature is included.

Treatment for tapeworm, Moniezia, infestation of sheep, G. Dikmans (*North Amer. Vet., 16* (*1935*), *No. 7, pp. 29–32*).—This is a review of a report by Skriabine and Schulz previously noted (E. S. R., 72, p. 102).

Tuberculosis of buffaloes in Egypt, with some tuberculin-test experiments, M. Carpano, trans. by Z. Mohamed (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 138* (*1935*), *pp. 19, pls. 8*).—It is concluded that while buffaloes are immune to most of the infectious and epidemic diseases, they are as susceptible to tuberculosis as are the cattle that live with them under similar conditions.

Studies on the endoparasitic fauna of Trinidad mammals.—I, Some parasites of Trinidad deer, T. W. M. Cameron (*Canad. Jour. Res., 13* (*1935*), *No. 5, Sect. D, pp. 89–96, figs. 11*).—Four parasites of *Mazama simplicicornis*, the single species of deer which occurs in Trinidad, are described, namely, *Nematodirus urichi* n. sp., *Mazamastrongylus trinitatis* n. g. and sp., *Ierestrongylus filiformis* n. g. and sp., and *Mazamanema longibursatum* n. g. and sp.

The distribution of swine influenza virus in swine, M. L. Orcutt and R. E. Shope (*Jour. Expt. Med., 62* (*1935*), *No. 6, pp. 823–826*).—This is a further study (E. S. R., 65, p. 674; 68, p. 532; 74, p. 394) of swine influenza, a disease of complex etiology caused by the concerted action of a filtrable virus and the bacterium *Hemophilus influenzae suis*, neither of which alone is capable of inducing the disease. The swine influenza virus was found to be "regularly present in the turbinates, tracheal exudate, and lungs of infected swine, but not in the spleens, livers, kidneys, mesenteric lymph nodes, colon mucosae, brains, or blood. It was present in low concentration in the bronchial lymph nodes of two out of eight animals. This localization of the virus in swine accords with its classification as a pneumotropic virus."

The actions of morphine on the horse, R. S. Amadon and A. H. Craige (*Penn. Univ., Vet. Ext. Quart. No. 60* (*1935*), *pp. 26, figs. 3*).—This report of a project aimed at the development of a more efficient sedative for the horse deals with morphine, dihydromorphine, codeine, dihydropseudocodeine, dionine, and dihydromorphinone (Dilaudid). A list is given of 15 references to the literature.

Experimental studies on equine encephalomyelitis formalized brain tissue vaccine, M. S. Shahan and L. T. Giltner (*North Amer. Vet., 16* (*1935*), *No. 6, pp. 18–26*).—In continuation of the earlier work (E. S. R., 71, p. 538), additional tests of the protective value under controlled experimental conditions of field trials made in Delaware and Virginia, where the disease had been epizootic, are reported upon. All the work was conducted with a representative eastern strain of virus which was recovered from a field case in 1933.

"The encephalomyelitis vaccine described and used consisted of virus containing brain tissue, removed from horses after prostration or death following intracerebral inoculation, suspended 1 part in 9 parts of physiological salt solution and inactivated (killed) by the addition of 0.4 percent formalin. In treating over 400 horses under experimental and field conditions, no evidence was obtained that the product was capable of reproducing the disease when used in two doses of 25 cc each. Aside from a local reaction of transitory nature, no inconvenience to the animals treated was observed.

"Evidence of efficacy of the product was obtained in both laboratory and field trials. Of 13 vaccinated horses 9 were sufficiently protected to withstand an intralingual inoculation of virus sufficiently active to cause the development of encephalomyelitis in 13 control animals, of which all but 2 died as a result of the disease or were sacrificed in extremis. In one test 2 horses were protected by use of a vaccine 7 mo. old, and in another 2 horses were protected by use of 6-month-old vaccine. In still another test 2 of 5 horses treated with vaccine of 3 mo. of age were protected. The indications are that the vaccine retains its antigenic potency for some months. As to the duration of immunity, our tests are too limited to draw definite conclusions. It appears, however, that while the high degree of immunity is present after a period of 6 weeks, there is still evidence of immunity some months after vaccination.

"In field trials in Virginia and Delaware over 300 horses and mules were treated with the vaccine. While encephalomyelitis developed in some of the vaccinated animals, indicating that the procedure does not confer 100 percent immunity against natural exposure (vaccination likewise did not afford 100 percent protection against artificial exposure), the available data, from Virginia trials at least, show a higher incidence of the disease in the nonvaccinated animals. In addition, in the districts where vaccination was carried out, there was a much lower morbidity than in areas where vaccination was not practiced."

The authors' observations indicate that a definite period of time should be allowed for the vaccinated animal to develop immunity (15 to 30 days) before possible exposure to infection.

Equine cutaneous leishmaniasis: Treatment with berberine sulphate, S. C. J. Bennett (*Jour. Compar. Path. and Ther., 48 (1935), No. 3, pp. 241–243, pl. 1*).—A description is given of what appears to be the first recorded case of equine cutaneous leishmaniasis and its treatment with berberine sulfate. A complete cure followed the injection of a single set of local injections totaling 4 cc of a 1 percent solution, but a rather troublesome edema also resulted.

Handling heart worm disease in practice, E. B. Dibbell (*Vet. Med., 30 (1935), No. 11, pp. 498–499, figs. 4*).—Examinations made of hospitalized dogs at Baltimore, Md., are said to have shown about 18 percent of the large dogs and 10 percent of the small dogs to be parasitized by the heart worm *Dirofilaria immitis*, for which mosquitoes of the genera *Anopheles*, *Aedes*, *Myzorhynchus*, and *Culex* serve as intermediate hosts.

A note on Oncicola canis (Kaupp), a parasite of the dog, R. E. Rebrassier (*Jour. Amer. Vet. Med. Assoc., 87 (1935), No. 5, pp. 573, 574*).—The occurrence of this acanthocephalid in a dog at Columbus, Ohio, is recorded. This is said to be the first case reported from Ohio and only the second case to be reported from any State other than Texas.

Healthy carriers of poultry diseases, H. A. Hoffman (*Calif. Dept. Agr. Bul., 24 (1935), No. 3, pp. 317–321*).—Reference is made to healthy carriers of pullorum disease, fowl typhoid, fowl cholera, infectious laryngotracheitis, infectious colds, blackhead, and other diseases.

Studies of total erythrocyte and leucocyte counts of fowls, III, IV (*Canad. Jour. Res., 13 (1935), Nos. 4, Sect. D, pp. 61–71, figs. 2; 5, Sect. D, pp. 85–88*).—A continuation of earlier work (E. S. R., 73, p. 394).

III. *Variation in number of blood cells of normal fowl*, J. Biely and E. I. Palmer.—Counts were made of the erythrocytes and leucocytes of 100 apparently healthy and vigorous Single Comb White Leghorn hens. Post-mortem examinations made following the counts did not reveal any striking abnormalities, and with few exceptions the birds were exceptionally free from intestinal parasites.

"The range of the erythrocyte counts was found to be 1,805,000 to 3,845,000 and of leucocyte counts 18,330 to 49,000. The data are analyzed statistically. In respect to the erythrocyte counts, the authors' data are in complete agreement with the recent studies by Cook and Dears'yne of 75 female birds [E. S. R., 71, p. 102]. There is, however, a marked difference in the range (3,000–47,000) and the mean of the leucocyte counts, which may be due to the different technic employed by Cook and Dearstyne.

"Total erythrocyte and leucocyte counts were also made of 47 1- to 2-day-old chicks. The range of the erythrocyte counts was found to be 1,800,000 to 3,180,000 and of the leucocyte counts 15,000 to 28,330. A statistical analysis of the data is presented. In the case of the baby chicks, since the environmental conditions are relatively uniform, it would appear that factors other than environment affect the total erythrocyte and leucocyte counts of individual chicks."

IV. *Erythrocyte and leucocyte counts of birds raised in confinement*, E. I. Palmer and J. Biely.—Erythrocyte and leucocyte counts were made of 65 female and 50 male Single Comb White Leghorns raised in confinement from the age of 1 day until sexual maturity.

"The mean erythrocyte count of the males was significantly higher than the mean of the females. There was no significant difference between the mean leucocyte counts of the males and the females. The erythrocyte counts of the confined birds were significantly lower than those of normal birds kept under natural conditions and those of 1- to 2-day-old chicks, while the leucocyte counts were significantly higher."

On chemotherapy in leucosis of fowls, J. Engelbreth-Holm, A. Rothe Meyer, and E. Uhl (*Acta Path. et Microbiol. Scand., 12 (1935), No. 4, pp. 491–510*).—In therapeutic experiments with leucosis of fowls (erythroblastosis), an organic lead preparation (R 237 b (Rothmann), sodium plumbo-dithio-pyridinecarbonate), administered in 0.5 cc of a 5-percent solution, plasmochin (Bayer), a derivative of quinine, administered in 1.5 cc of a 1-percent solution, and rhodoquine (special, Paris), administered in 0.5 cc in a 0.4-percent solution, all given intravenously and daily, proved largely ineffective. The lead preparation proved to be strongly hemotoxic. Rhodoquine was the only one of the three preparations that had any inactivating effect upon the leucotic agent.

Anthrax infection in birds, M. Carpano, trans. by E. J. Moreno (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 153 (1935), pp. 18, pls. 4*).—The experiments reported show that chickens, pigeons, and sparrows are very resistant and nearly immune to anthrax infection. The resistance to development of the anthrax bacillus may be experimentally overcome by weakening the birds either by physical or chemical means, which, through withdrawing all their means of reaction and often reducing temperatures, transform them into easily cultivated subjects. Birds are very susceptible to anthrax toxins. *Bacillus anthracis* experimentally introduced in these animals acts principally by its toxic powers. The grave case of natural anthrax infection observed in an ostrich, which has a temperature similar to that of a mammal, is considered to emphasize the importance of high body temperature as a means of defense by birds against the anthrax infection.

Ranikhet disease, S. M. A. Shah and Sadarud Din Ahmad (*Indian Vet. Jour., 12 (1935), No. 2, pp. 131–135*).—In the course of the account it is pointed out that about 90 percent of the Indian country-bred fowls are susceptible to this highly infectious disease of fowls, resulting in a mortality of 90 percent.

A malarial parasite infecting all blood and blood-forming cells of birds, C. G. Huff and W. Bloom (*Jour. Infect. Diseases, 57 (1935), No. 3, pp. 315–336, pls. 2, figs. 5*).—The results of observations and experiments on the kinds of cells infected by the avian parasite *Plasmodium elongatum*, the morphology of its asexual stages, the periodicity of its segmentation, and related characteristics are reported.

A serological variant of Salmonella aertrycke isolated from pigeons, P. R. Edwards (*Jour. Bact., 30 (1935), No. 5, pp. 465–471*).—This contribution from the Kentucky Experiment Station reports upon a biochemical and serological study of cultures isolated from pigeons in three widely separated communities which has led to the recognition of a serological variant of *S. aertrycke*. The organism differs from *S. aertrycke* in that it possesses somatic antigens identical with those of *S. abortus-equi*. Some strains of the variant fail to ferment maltose, and all give a negative Bitter test. The term *S. aertrycke* var. *storrs* is proposed to designate this type.

Infectious myxomatosis of domestic rabbits, F. D. McKenney and J. E. Shillinger (*Jour. Amer. Vet. Med. Assoc., 87 (1935), No. 6, pp. 621–630, figs. 2*).—A description is given of this highly contagious and frequently fatal disease of the domestic rabbit due to a filtrable virus.

Tests of anthelmintics for the removal of rabbit parasites, W. H. Wright and J. Bozicevich (*North Amer. Vet., 16 (1935), No. 7, pp. 20–28, 29*).—The results of experimental testing of anthelmintics against rabbit parasites are summarized as follows:

"Oil of chenopodium in doses of 0.15 cc per kilogram of body weight, followed immediately by 10 cc of castor oil by mouth, removed, respectively, 52.4 and 100 percent of the pinworms (*Passalurus ambiguus*) from 2 rabbits. In 1 case, the 10-cc dose of castor oil did not provide adequate purgation and it was necessary to give the animal an additional 15 cc of castor oil. It is believed that the efficacy of the drug, which in this case was 52.4 percent, was lowered because of insufficient elimination.

"Tetrachlorethylene in doses of 0.3 cc and 0.5 cc per kilogram of body weight, followed by 3 g of Epsom salt in solution by mouth in 1 case and by 5 cc of a saturated solution of Epsom salt in a second case, removed, respectively, 70.4 and 90.6 percent of the pinworms from 2 rabbits.

"Tetrachlorethylene at a dose rate of 0.5 cc per kilogram of body weight, administered after a 24-hr. fast, was usually very effective for the destruction of stomach worms (*Obeliscoides cuniculi*). For best results, animals should not be fed or watered for 3 to 4 hr. after treatment. Lower efficacies were secured in rabbits which had apparently not been properly fasted before the administration of the anthelmintic.

"Carbon tetrachloride at a dose rate of 0.3 cc per kilogram of body weight apparently killed most of the stomach worms present in 1 rabbit treated with this drug.

"Oil of chenopodium or tetrachlorethylene was not effective for the removal of trichostrongyles (*Trichostrongylus calcaratus*). Preliminary flooding of the stomach and intestinal tract with 60 cc of a 2 percent solution of sodium bicarbonate prior to the administration of tetrachlorethylene added little or nothing to the efficacy of the treatment.

"Tetrachlorethylene at a dose rate of 0.5 cc per kilogram of body weight, administered after a 24-hr. fast, was effective for the destruction of pinworm (*P. ambiguus*) larvae in the stomach.

"Oil of chenopodium in a dose of 0.15 cc per kilogram of body weight, followed by castor oil, failed to remove whipworms (*Trichuris leporis*) from the 1 rabbit infested with these worms.

"When properly administered, oil of chenopodium, carbon tetrachloride, or tetrachlorethylene was without harm to rabbits used in these tests. In the doses employed, these drugs apparently have an adequate margin of safety for rabbits. However, little can be concluded from so few tests as to the safety of these drugs in practice. Clinical experience in the treatment of hundreds or thousands of rabbits might bring to light contra-indications for the use of these drugs which could not be expected to be represented in a few experimental animals."

AGRICULTURAL ENGINEERING

Report of the Chief of the Bureau of Agricultural Engineering, 1935, S. H. McCrory (*U. S. Dept. Agr., Bur. Agr. Engin. Rpt., 1935, pp. 22*).—This report briefly presents the progress results of investigations in irrigation (utilization of water, underground storage, silt in Texas streams, evaporation studies, and irrigation in the humid regions); drainage of sugarcane lands, control of ground water in peat and muck soils, and durability of drain tile; soil erosion control; farm operating efficiency; farm structures (improvement, repairs, and equipment); storage and transportation of farm products; machinery for corn, cotton, and sugar beet production, insect control, fertilizer distribution, forage-crop drying, seed grain treaters, and special harvesters; and cotton ginning. It is pointed out that a large part of this work is conducted in cooperation with the State experiment stations.

[Agricultural engineering investigations at the Illinois Station] (*Illinois Sta. Rpt. 1934, pp. 110, 111, 195–206, figs. 2*).—The progress results are briefly presented of investigations by C. W. Crawford, E. T. Robbins, and W. M. Dawson on factors influencing the pulling ability of horses and mules; on the use of electricity on the farm, by E. W. Lehmann and A. L. Young; farm home sewage disposal, by Lehmann and A. M. Buswell; use of low grade oils in the tractor engine and of rubber tires on tractor wheels, both by R. I. Shawl; new plow attachments for combating insect pests, by Young and Shawl; terraces and contour farming for reducing soil erosion, by Lehmann and E. G. Johnson; harvesting methods, by Lehmann, Young, and Shawl; machine for harvesting artichokes, by Lehmann and Shawl; wheat storage, by W. L. Burlison, G. H. Dungan, Lehmann, and R. H. Reed; stationary spraying, by Lehmann, Reed, H. W. Anderson, and R. L. McMunn; and gas production from farm wastes, by H. P. Rusk, Buswell, Lehmann, E. E. DeTurk, and L. J. Norton.

[Agricultural engineering investigations by the Wisconsin Station] (*Wisconsin Sta. Bul. 430 (1935), pp. 58–61, 106–112, figs. 4*).—The progress results are briefly presented of investigations on soil erosion control which are being conducted in cooperation with the U. S. D. A. Soil Conservation Service; hay harvesting machinery, by F. W. Duffee; hay cutting, by Duffee, L. F. Graber, G. Bohstedt, B. H. Roche, and E. B. Hart; and a new type buhr feed mill, by Duffee, H. D. Bruhn, et al.

Geology and ground-water resources of Atascosa and Frio Counties, Texas, J. T. Lonsdale (*U. S. Geol. Survey, Water-Supply Paper 676 (1935), pp. V+90, pls. 8, figs. 4*).—The purpose of this investigation was to determine the source, quantity, and quality of the ground water used for irrigation and other purposes in the above area.

Bibliography on rural water supply, compiled by D. W. GRAF (*U. S. Dept. Agr., Bur. Agr. Engin., 1935, pp. 24*).—A selected list of references.

The role of field drains in removing excess water from the soil.—I, Some observations on rates of flow from outfalls, H. H. NICHOLSON (*Jour. Agr. Sci.* [*England*], *24* (*1934*), *No. 3, pp. 349–367, figs. 3*).—In a contribution from the School of Agriculture of Cambridge University, some records of tile drain performance made in 1856–57 are reexamined and the different aspects of drainage in heavy and light soils indicated.

The existence and influence of the movements of the water table in connection with the behavior of light land drains are demonstrated. The problem of the water table in heavy land is discussed, and the behavior of field test holes in such circumstances is explained by surface drainage into them. The magnitude of the fluctuations in run-off from heavy land and the need for closer records of outfall performance are stressed.

Observations on the behavior of mole drains on heavy clay land are described. Comparison of grass and arable land records reveals differences analogous to those between heavy and light land. An account is given of the effects of the advance of the drainage season and of the distribution of rainfall within the season. The nature of the differences in action of tile and mole drains is described.

The effects of variations in the agricultural treatment of one soil type on its drainage properties are indicated. Examples are given of the drying out of the soil and subsoil in the absence of a soil mulch, of the power of surface cultivations to keep the subsoil moist, and of the influence of cultivations in drying out the surface soil, together with their effects on the subsequent drainage history of the area involved.

Corrosiveness of certain Ohio soils, I. A. DENISON and S. P. EWING (*Soil Sci., 40* (*1935*), *No. 4, pp. 287–299, figs. 2*).—The soils occurring along a 200-mile section of a pipe line system in Ohio have been mapped by the U. S. Bureau of Standards, the corrosiveness of each type having been estimated from the corrosion actually experienced in operating the pipe lines. The average total acidity and resistivity of each of the soil types were determined and correlated with the known corrosiveness of the soils. A formula was derived whereby the corrosiveness of the soils can be approximated from the values for total acidity and resistivity. "Flood plain and terrace soils are, however, more corrosive than would be indicated by the formula." The corrosiveness of the soils was related to the texture of the subsoil and to the degree of development shown by the soil profile. Soils having the heaviest subsoils and showing the least profile development were found to be the most corrosive. Very little corrosion occurred in light-textured, well-drained soils.

Report of the Chief of the Soil Conservation Service, 1935, H. H. BENNETT (*U. S. Dept. Agr., Soil Conserv. Serv. Rpt., 1935, pp. 42*).—This report, the first of this Service, discusses the history, organization, objectives, and plan of work of the Soil Conservation Service. A section on investigation and research describes the character, status, and progress of investigations on soil erosion.

The Abney level handbook, H. A. CALKINS and J. B. YULE (*U. S. Dept. Agr., Forest Serv., 1935, pp. III+44, figs. 27*).—This instrument is described and illustrated, and technical information and data are given on its use in forest surveying.

Report of the Chief of the Bureau of Public Roads, 1935, T. H. MACDONALD (*U. S. Dept. Agr., Bur. Pub. Roads Rpt., 1935, pp. 60*).—In addition to a progress report of the administrative activities of the Bureau, especially as they relate to Federal aid and other funds for highway construction, a brief account is given of economic and statistical investigations, highway management and production cost studies, and physical researches on highway structures and materials conducted during the year.

Public Roads, [November 1935] (*U. S. Dept. Agr., Public Roads, 16 (1935), No. 9, pp. 169–200+[2], figs. 49*).—This number of this periodical contains the current status of U. S. Public Works road construction as of October 31, 1935, and part 2 of an article on The Structural Design of Concrete Pavements, by L. W. Teller and E. C. Sutherland (pp. 169–197) (E. S. R., 74, p. 402).

Bibliography on new building materials, compiled by D. W. GRAF (*U. S. Dept. Agr., Bur. Agr. Engin., 1935, pp. 9*).—A list of references.

Strength and related properties of woods grown in the United States, L. J. MARKWARDT and T. R. C. WILSON (*U. S. Dept. Agr., Tech. Bul. 479 (1935), pp. 99, figs. 40*).—This bulletin presents data from a study begun in 1910, involving several hundred thousand tests of the mechanical and some of the related physical properties of 164 species of native woods, together with related information on factors that affect strength properties.

The information given may be used not only for comparing species but also for calculating the strength of wood members, for establishing safe working stresses when used in conjunction with other information including results of tests of structural timbers, and for grouping species into classes of approximately like properties for various purposes. The bulletin is based on the same series of tests but supersedes Bulletin 556 (E. S. R., 37, p. 885), covering additional species and additional tests on species previously reported.

In addition to the data from the standard series of tests begun in 1910, there are included results of all earlier tests by the Forest Service that were made in such a manner as to afford data of comparable character to that resulting from the standard series.

Simplified computation of vertical pressures in elastic foundations, N. M. NEWMARK (*Ill. Engin. Expt. Sta. Circ. 24 (1935), pp. 19, figs. 6*).—From a mathematical analysis of the problem a table is presented giving the vertical pressure on elastic foundations in terms of the intensity of load at a point a unit depth below the corner of a rectangular area uniformly loaded. Various examples illustrating the use of the table are also given.

Boiler-water troubles and treatments with special reference to problems in western Oregon, R. E. SUMMERS (*Oreg. Engin. Expt. Sta. Bul. 5 (1935), pp. 52, figs. 18*).—This bulletin presents a critical review of what is now established in boiler-water chemistry. The attempt is made to set up briefly in one reference a practical background of established fact for the use of boiler operators in any place. Certain peculiar and specific problems encountered in western Oregon are so outlined as to bring them suitably to the attention of boiler users and others concerned.

It is considered apparent that no natural water, regardless of its freedom from hardness, is entirely satisfactory for boiler use without at least some treatment or chemical control. The highly soft natural waters of western Oregon, and perhaps other waters from diverse localities softened to a like degree, are inclined, under the prevailing high boiler temperatures, minimum blow-down rates, and limited boiler-water alkalinities (demanded by metal-embrittlement control), to cause the deposition of very hard, heat-resistant boiler scale of the most objectionable and dangerous type.

Oil and gasoline information for motorists, G. C. WILSON (*Wis. Engin. Expt. Sta. Bul. 78 (1934), pp. 160, figs. 14*).—A large amount of both technical and popular information is given relating to gasoline, lubricating oil, and gasoline and oil testing and specifications. Chapters are included on volatility of gasoline, impurities in gasoline, detonation, vapor lock, carburetion and gasoline consumption, special motor fuels, the selection of a motor fuel, the theory of lubrication, lubricating systems, crankcase oil temperatures during operation, oil consumption, reasons for changing crankcase oil, oil reclamation, selection of oil by the motorist, production of gasoline and lubricating oil, the testing of gasoline, specifications for motor fuels, laboratory oil tests, operating tests of crankcase lubricating oil, and the selection of crankcase oils from specifications. A bibliography of 87 references to work bearing on the subject is included.

Alcohol and alcohol-gasoline blends as fuels for automotive engines.—III, Performance tests of alcohol, gasoline, and alcohol-gasoline mixtures as fuels for an eight cylinder automobile engine, A. L. Teodoro (*Philippine Agr., 24 (1935), No. 5, pp. 352–387, figs. 18*).—The purpose of this study, the third contribution to the subject (E. S. R., 74, p. 266), is to determine the performance of an 8-cylinder engine when gasoline, alcohol, and alcohol-gasoline mixtures are used as fuels. The important points considered were operating characteristics and fuel economy.

Two groups of tests were carried out. In the first group 11 series of bench studies were made on 11 different kinds of fuels, while in the second group 7 series of road tests were conducted. Denatured alcohol 193° proof was used in the fuel mixtures containing from 10 to 50 percent alcohol. From 50 percent up, a grade containing only 190° proof alcohol was utilized.

The engine used showed a very satisfactory performance when alcohol, gasoline, and alcohol-gasoline combinations were used as fuels. A mixture containing 5 percent 193° proof denatured alcohol was found miscible with gasoline at temperatures as low as 21° C. The engine adjustment best suited for gasoline was found ideal for operation on mixtures containing as high as 15 percent alcohol. To obtain a very satisfactory performance, a part choking of the carburetor was needed for mixtures containing 20 percent alcohol. To produce the same power as gasoline without changing the size of the venturi tube or of the air passage area, jets larger than the one adapted for gasoline were used for mixtures containing at least 15 percent alcohol.

At speeds below 500 r. p. m., very economical adjustments with mixtures containing at least 20 percent alcohol were often characterized by jerky and uneven operations. Engine detonation was much in evidence using gasoline at full throttle. Pinking was minimized as the percentage of alcohol in the mixture was increased. No sign of detonation was noted at any load and speed when the mixture used contained at least 20 percent alcohol. In general, constancy in operation at higher loads could be maintained for a longer time with the mixtures than with gasoline, and greater maximum power could be developed with the mixtures. This was true especially for mixtures containing a large amount of alcohol. As the percentage of alcohol in the mixture was increased, the engine pick-up was slightly slowed down. Engine-starting with almost straight alcohol was not always very easy when the engine was cold.

In general it was observed that at full load and at some points in three-fourths load the mixtures containing as high as 20 percent alcohol were more economical than gasoline, while at other loads the larger the percentage of alcohol in the mixtures the higher was the fuel consumption per brake horsepower hour. The increases varied from an average of 4 to 6 percent for every 10 percent of alcohol added. The mixture containing the least amount of gasoline had the highest efficiency. At full load, gasoline had the lowest efficiency on all speeds. A mixture containing 10 percent alcohol gave greater mileage than gasoline under the conditions in which they were tested.

Mathematical and experimental studies on the form of chaff-cutter knives [trans. title], Y. TAMURA (*Nogyodoboku Kenkyu* (*Jour. Agr. Engin. Soc., Tokyo, Japan*), *7* (*1935*), *No. 3, pp. 261–281, figs. 28; Eng. abs., p. 281*).—In a contribution from the Kyoto Imperial University, studies are reported in which a new coordinate system of expressing the curve of the edge of the knife of a chaff cutter was developed. Two general forms of spirals for these knives are recommended which are designated as the constant angle type and the constant speed type. The testing apparatus is described.

Comparative efficiency of electrically operated tanks versus ice in the cooling of milk, J. H. FRANDSEN (*Jour. Dairy Sci., 18* (*1935*), *No. 7, pp. 479, 480*).—In a brief contribution from the Massachusetts Experiment Station the results of experiments are briefly reported indicating that the tank should be of ample capacity. Roughly speaking, when filled with cans to full capacity, there should still be room for twice as much water and ice as the milk. If the tank is of home construction there should be at least 3 or 4 in. of cork or its equivalent, and this must be protected against moisture. The experiments indicate that the water in the tank should always be as high as the milk line.

A study of the operating results of a number of small sewage treatment plants, W. F. SHEPHARD and E. F. ELDRIDGE (*Mich. Engin. Expt. Sta. Bul. 63* (*1935*), *pp. 27, figs. 6*).—Operating data are presented on 20 small sewage treatment plants in Michigan. The study consisted, in most of the plants, in the collection and analysis of two 24-hr. composite samples from the influents and effluents of the various units. The units included in the survey consisted of 12 Imhoff tank plants, 3 septic tank plants, 4 plants with separate sedimentation and sludge digestion tanks, 7 sand filter plants, 4 with trickling filters, 2 with contact filters, and 1 activated sludge plant.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics at the Illinois Station, 1933–34] (*Illinois Sta. Rpt. 1934, pp. 163–194, figs. 2*).—Results not previously noted are reported for the following investigations: (1) Findings by H. C. M. Case, M. L. Mosher, J. B. Andrews, and J. B. Cunningham for 1930–32 of the work done by the farm bureau farm management service as to farm organization and management in areas including Henry, Knox, Peoria, and Stark Counties and Livingston, McLean, Tazewell, and Woodford Counties; findings by P. E. Johnston, L. Wright, J. E. Wills, and Mosher on farm earnings in 1933 on 1,372 farms in different areas of the State; findings by Case, R. H. Wilcox, and E. L. Sauer as to costs of production of corn, oats, soybeans, and wheat in east-central Illinois in 1932 and 1933 and of soybeans in 1931–33 in Champaign and Piatt Counties, by R. C. Ross; some additional findings by Johnston in a study of combined man-labor, horse, and machinery costs on farms using different types of power; findings in a study by R. C. Ashby and H. P. Rusk of the effect of local livestock markets on terminal markets, general level of prices paid producers, etc.; results of a study made by Wilcox and L. E. Card of the cost of producing eggs and the returns on 28 poultry flocks in 1933; findings in a study by Johnston and R. S. Marsh of the costs and profits in producing fruits and vegetables, 1932 and 1933; and some findings in a study by J. W. Lloyd of possible reductions in fruit packing costs through improvements in packing-house organization and management and in a study by Lloyd and S. W. Decker of the effects of cooling shipped fruits on losses.

Current Farm Economics, Oklahoma, [October and December 1935] (*Oklahoma Sta., Cur. Farm Econ., 8* (*1935*), *Nos. 5, pp. 89–112, figs. 2; 6, pp. 113–*

136, figs. 3).—Both numbers include the usual tables of indexes of prices and purchasing power of farm products and time deposits in Oklahoma. No. 5 includes (1) reviews of the general agricultural and industrial situation and the meat animal situation, by T. R. Hedges, and of the feed crop situation, by I R. LeCamp; and (2) articles on the processing tax the farmers' tariff, by L. S. Ellis; cotton ginning rates in Oklahoma and neighboring States, by R. A. Ballinger; and how much cotton should America plant? by J. T. Sanders. No. 6 includes (1) reviews of the general situation and the cotton situation, by Hedges; the meat animal situation, by P. Nelson; and the broomcorn and wheat situations, by Ballinger; and (2) articles on cash income to Oklahoma farmers for 1935, by H. A. Miles; the battle against farm tenancy in Oklahoma, by Sanders; the organization of land utilization division, Resettlement Administration, region VIII, by C. P. Blackwell; and the rural resettlement program, by W. J. Green.

[Investigations in agricultural economics by the Wisconsin Station, 1933–34] (*Wisconsin Sta. Bul. 430* (*1935*), *pp. 62–83, figs. 6*).—Investigations in agricultural economics not previously noted are reported on as follows: (1) Tables and a chart are included and discussed showing the percentage distribution of land by land uses and by slope intervals on 30 farms in Vernon County in August 1933, as found by M. H. Cohee, G. S. Wehrwein, and N. Clark in a study of erosion, land use, and farm management practices; (2) tables are included and discussed showing the economic progress, money income during 1933, taxes, tax delinquency, and proportion of farmers on relief, distance to market, neighbors, schools, churches, and doctors of 1,233 owner operators grouped by length of residence, as found by Wehrwein, Clark, and R. F. Spilman in an economic study of isolated settlers in 23 northern counties of Wisconsin, and some correlations are made; (3) tables by G. F. Wehrwein give data, by years 1928–32, regarding delinquency in property taxes levied in the rural towns of Dane and Iron Counties; (4) a table and a chart present data as to farm receipts, expenses, and labor income in La Crosse County farms, as found by D. R. Mitchell in a study of measures farmers are using to adjust farm business to depression price levels; (5) a table showing the annual differences in prices quoted for different types of hogs in the Milwaukee and Madison markets, 1929–33, as found in a study made by M. A. Schaars, W. F. Finner, and R. E. Fisher; (6) a table showing the number of different kinds of livestock trucked to Milwaukee, 1920, 1925, 1930, and 1934, as found in a study by Schaars of the effects of trucking on livestock marketing; (7) some findings in a study by Schaars and A. C. Hoffman of the factors responsible for the differences in quality and value of veal calves and the need for accurate grading at shipping points; (8) charts with discussion by H. H. Bakken and M. A. Abrahamsen showing for the period 1905–34 the total consumption in the United States of different kinds of chewing tobacco, the total amount of scrap chewing tobacco manufactured in the United States and the amount of Wisconsin leaf tobacco used in the manufacture of scrap chewing tobacco, and the number of cigars of different classes consumed in the United States, 1920–34; and (10) a chart with discussion by A. Hobson and D. S. Anderson showing the relation, 1919–34, of the per capita consumption of cheese, price of cheese "twins" at Plymouth, Wis., and factory pay rolls in the United States.

The agricultural outlook for 1936 (*U. S. Dept. Agr., Misc. Pub. 235* (*1935*), *pp. 144*).—"This report presents a summary of facts bearing upon the present situation and probable developments with respect to agricultural production and marketing in 1936. The best available information has been assembled and carefully studied before preparing statements designed to help farmers in making decisions for the next year's operations. These statements were prepared by the staff of the Bureau of Agricultural Economics and have been considered in detail and revised in conference with agricultural economists from the agricultural colleges, experiment stations, and extension services of the States, as well as others representing other Bureaus of the Department of Agriculture, the Agricultural Adjustment Administration, and the Farm Credit Administration. . . . The facts concerning foreign competition and demand were . . . more comprehensive than have been available at any time in the past, as a result of the numerous special studies on general subjects relating to foreign-trade agreements. A section of the report on the outlook for farm-family living has been prepared in cooperation with the representatives of the Bureau of Home Economics and the Extension Service for the last 4 yr."

The report covers the domestic and foreign demand for agricultural products, agricultural credit, farm labor, equipment, fertilizers, etc., farm-family living, and different crops, fruits, and vegetables, different kinds of livestock and poultry, and livestock and poultry products.

Type of farming areas in Colorado, B. HUNTER, L. A. MOORHOUSE, R. T. BURDICK, and H. B. PINGREY (*Colorado Sta. Bul. 418 (1935), pp. 135, figs. 46*).—The method used in this study, made in cooperation with the Bureau of Agricultural Economics, U. S. D. A., was historical, graphical, and analytical. "The development of agriculture within the State has been studied from early in its beginning; the various factors which have been and now are shaping Colorado's agriculture have been carefully considered; the distribution of crops and livestock on a county basis and types of farms by minor civil divisions have been shown graphically; the State has been divided into type-of-farming areas on the basis of the dominant type of farm and also on the basis of the proportion of the gross income from different sources within each area; and finally, the mapping of the State into type-of-farming areas has been verified by inspecting each area and consulting men familiar with local conditions."

Tables, maps, and charts are included and discussed, showing the physical, biological, and economic factors in the agricultural development of Colorado, and the distribution of crop and livestock enterprises and farms by type. The State is divided into 17 types of farming areas, and each area is described and its crop and livestock enterprises, types and organization of farms, etc., are discussed.

Land use in Pennsylvania, P. I. WRIGLEY (*Pennsylvania Sta. Bul. 317 (1935), pp. 39, pl. 1, figs. 3*).—This study was made in cooperation with the Bureau of Agricultural Economics, U. S. D. A. The lands in the State are divided into 7 classes—forested, 5 classes of agricultural land, and land consisting of cities, boroughs, and areas adjacent where there is little or no agriculture. The 5 classes of agricultural lands were determined using 2 indexes—the index of crop productivity and the index of farm returns per acre of land in farms—based on the 1930 Census of Agriculture. Two other indexes, the weighted crop yield index and the index of farm returns per farm, are included for purposes of comparison. These indexes are described as follows:

"The weighted crop yield index is a composite index of the yields of the 6 major farm crops; corn, corn silage, potatoes, wheat, oats, and hay. The importance given to the yield of each crop in the index is based on the approximate average amount of man labor required per acre. The average of the entire State is taken as 100.

"The index of crop productivity is similar to the weighted crop yield index except that it combines with yield the intensity of farm use and that the basis of comparison is all of the land in farms and not merely the acres producing the 6 farm crops which were used in computing the index. . . .

"The index of farm returns per acre of land in farms is expressed as a percentage of the farm income of an equal amount of average Pennsylvania farm land. In both cases the value of farm products used by the farmer's family is included, but the cost of fertilizer and purchased feed is deducted. This index was obtained by using census figures for 'value of all farm products sold, traded, or used by the farmer's family' and subtracting from these the expenditures for feed and fertilizer. . . .

"The index of farm returns per farm is the same as the preceding index except that the basis of comparison is the average farm of a township instead of an average acre of farm land."

Tables are included showing (1) for each class of land the total acreage, percentage in farms, and the value (percentage of State and per farm) of agricultural production less purchased feed and fertilizer, and (2) for each county and township the percentage of land in farms and the 4 index numbers of agricultural production. A map shows the location of the 7 types of land.

A study of the organization and management of potato farms in central Maine, W. E. Schrumpf (*Maine Sta. Bul. 379 (1935), pp. 81–137, figs. 9*).—The purpose of this study was to show (1) the financial and physical make-up of the farms, including (a) capital, receipts, expenses, and profits, and (b) acreage of crops, pasture, and woodland, as well as the number of various kinds of livestock; (2) cultural practices on potatoes and the relationship between variations in cultural practices and yield of potatoes per acre; and (3) the influence on labor income of various factors such as size of business, production rates, work efficiency, use of capital, and farm balance. Data for the 2 yr. ending March 31, 1930 and 1931 were obtained from 38 farms selected at random from those deriving at least 50 percent of their annual receipts from potatoes.

The average farm income on the farms studied was $2,310, labor income $1,686, returns on capital $1,115 or 8.9 percent. Large size of farm business, high production rates, and high work efficiency were associated with large labor income. The average labor income was $1,928 for the farms having at least one of the factors, acres of potatoes, yield of potatoes per acre, or acres of potatoes per man above the average. It was $3,126 for those having at least 2 of the factors above the average and $3,884 for those where all the factors were above the average. The lowest average labor income, —$115 per farm, was on the farms above the average as to size of business but below in yield per acre and acres of potatoes per man. The 3 farms with all the 3 factors 5 percent above the average had 150 more productive-man-work units, 3 acres more crops, 7 acres more potatoes, 12.4 more productive-animal units, and $416 more capital than the average. The yield of potatoes was 33 bbl. higher, the crop index 22 points higher, the value of livestock and livestock products sales per productive-animal unit $41 more, acres of potatoes per man 2.6 more, productive-man-work units per man 59.8 units higher, and the labor income $2,800 greater than the all-farm averages.

Relative economic advantages of harvesting cotton by picking and snapping in western Oklahoma, C. C. McWhorter and R. A. Ballinger (*Oklahoma Sta. Bul. 227 (1935), pp. 74, figs. 9*).—According to this study, carried on in cooperation with the U. S. D. A. Bureau of Agricultural Economics, the practice of harvesting cotton by snapping is most prevalent in the western areas of Oklahoma, where a large proportion of the crop is produced. Picked cotton averaged higher in grade and longer in staple during 1932–33 and 1933–34 than snapped. Because of the extra weight of foreign matter, it required from 450 to 500 lb. more seed cotton harvested by snapping than picked cotton to make a standard sized bale.

In 1932–33, it cost on the average 43 ct. per bale more to harvest enough cotton to gin a 500-lb. bale of lint by picking than it did by snapping, but it cost $2.26 more to gin the snapped than the picked cotton, making the net cost $1.83 per bale more for snapped cotton. However, in 1933–34 the cost of harvesting picked cotton was $1.66 per standard sized bale more than the cost for snapped cotton, while the cost for ginning the snapped cotton was only $1.38 more per bale, so that there was a net cost of 28 ct. per bale more for the picked cotton. This changed situation was caused by an increased spread between the costs of harvesting picked and snapped cotton and a narrower spread between the costs of ginning in 1933–34 than in 1932–33. An analysis of the prices received by farmers for picked and snapped cotton shows that on most days during each season studied local prices were higher for picked than for snapped cotton.

Because of the average or "hog-round" prices paid for cotton in the local markets, farmers received relatively high prices for cotton of lower grades and shorter staple lengths and relatively low prices for cotton of the higher grades and longer staple lengths. This discrimination tended to discourage farmers from attempting to produce the better qualities of cotton.

Farmers were paid a higher price for both picked and snapped cotton than the buyers could have realized for the cotton if they had delivered it in Houston, Tex., subject to ex-warehouse terms, on the same day in which they purchased it in the local market. For example, in 1932–33 picked cotton was worth on the average 0.36 ct. per pound more in Houston, Tex., than was paid for it in the local markets, but the average cost of delivering it to Houston, subject to ex-warehouse terms, was 0.72 ct. per pound. The buyers' margin was —0.36 ct. per pound. The loss for snapped cotton that year, calculated in the same way, would have been 0.27 ct. per pound. In 1933–34 the losses would have been 0.16 ct. per pound for picked cotton and 0.15 ct. for snapped. Data for the individual points studied show that there were losses for all points, except in one case, for snapped cotton in 1933–34. However, the amount of the loss varied widely between different points.

After differences in costs of harvesting and ginning and differences in the value of lint and cottonseed for both picked and snapped cotton per standard-sized bale were taken into consideration, the net returns to farmers were higher on most days for picked than for snapped cotton. In 1932–33, the net return on picked cotton averaged $3.70 per bale more than snapped cotton and in 1933–34, 85 ct. per bale more than snapped cotton.

Although the data in this study show that it was generally more profitable to farmers to harvest cotton by picking than by snapping, other factors may be of some importance in modifying these results. Cotton can be harvested more rapidly by snapping than by picking. Snapping enables a smaller labor force to harvest a given amount of cotton and to get the work done with less danger of weather damage to the cotton. This factor is especially important in western Oklahoma where the average amount of cotton produced per farm is relatively large.

Farm tenancy in the United States, 1925–1935.—A beginning of a bibliography, compiled by L. O. Bercaw and H. E. Hennefrund (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 59 (1935), pp. II+86*).—This mimeographed bibliography lists 298 references to books, pamphlets, and periodicals on farm tenancy and leases, published during the years 1925–1935. It includes numerous references on the Southern sharecropper controversy, a few items on land tenure, corporation farming, and supervised tenancy, and a few references to State official publications.

Mortgage loans on farm real estate in Brookings County, South Dakota, 1910–1930, with special reference to Aurora, Afton, and Argo Townships, G. Lundy (*South Dakota Sta. Circ. 23 (1935), pp. 42, figs. 16*).—This circular is one of the series previously noted (E. S. R., 70, p. 704). The methods of analysis and forms of presentation are the same as noted in the previous studies.

The amounts for 1910 and indexes for Brookings County for 1920 and 1930 (1910=100), respectively, were: Volume of indebtedness, $731,537, indexes 369 and 250; acreage under mortgage, 35,139, indexes 129 and 114; and average indebtedness per acre, $20.82, indexes 286 and 218. During the 10 yr. following 1920, 19.2 percent of the 1920 indebtedness was terminated by foreclosure, 25.6 percent of the incumbered acreage being foreclosed on. The percentage of total debt delinquent decreased from 13.7 percent in 1910 to 3.5 in 1920 and then increased to 18.4 percent in 1930. In 1910, 72.1 percent of the first mortgage funds came from individuals and 17.2 percent from insurance companies. In 1930, individuals furnished 16.5 percent and insurance companies 67.1 percent. Individuals and commercial banks supplied most of the second mortgage funds. The ratio of debt to sales price was 45.7 percent in 1910, 49.1 percent in 1920, and 68.4 percent in 1930. During a given period, lands purchased showed a higher percentage mortgaged than lands not changing hands.

An analysis of general property tax trends in South Dakota, with suggestions for administrative reform, R. B. Westbrook (*South Dakota Sta. Bul. 292 (1935), pp. 62, figs. 15*).—Part I, general trends in valuations and taxes, includes and discusses tables and charts showing by the years 1915–34, the total valuations and taxes in the State, taxes on agricultural lands as compared with general property taxes, and with taxes on agricultural lands in the United States as a whole and in the West North Central section; values of agricultural land and city and town property in the State; and the trends in the State of the valuations of real estate, personal property, and money and credits.

Part II, tax trends in State, county, school districts, townships, cities, and towns discusses the trends of taxes, the sources of revenues, valuations, tax levies, taxation problems, etc., in the different tax-levying jurisdictions in the State, and makes suggestions for reforms.

Price studies of the U. S. Department of Agriculture showing demand-price, supply-price, and price-production relationships, compiled by L. O. Bercaw (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 58 (1935), pp. 38*).—This is a mimeographed bibliography, with brief abstracts of the references.

The production-consumption balance of agricultural products in Michigan.—Part 1, Fruits and vegetables, G. N. Motts (*Michigan Sta. Spec. Bul. 263 (1935), pp. 64, figs. 13*).—This is the first of a series of bulletins on the production-consumption balance of various classes of the more important products in Michigan agricultural commerce. Tables and charts are included and discussed, showing for periods of years, usually 1922–33, the production, shipments to and from other States, destination of shipments, characteristics of such shipments, apparent consumption in Michigan, and other data for different fruits, vegetables, and truck crops for manufacture.

During the period studied the production in Michigan of sour cherries, grapes, cantaloupes, strawberries, celery, onions, and tomatoes increased; that of cabbage and potatoes decreased; and that for apples, peaches, pears, and plums showed little if any change. During the 5-yr. period 1929–33, the shipments of Michigan crops to other States were: Apples 33 percent, red cherries 6, sweet cherries 26, peaches 30, pears 39, grapes 72, strawberries 65, cabbage 13, cantaloups 58, celery 72, onions 81, potatoes 14, and tomatoes 42 percent. The percentages of annual receipts from other States during the Michigan season were: Apples 44 percent, sweet cherries 25, peaches 21, pears 46, plums 37, eastern grapes 24, strawberries 16, cabbage 8, cantaloups 19, celery 10, onions 54, potatoes from late States 31, and tomatoes less than 1 percent. Usually the shipments from Michigan exceeded the receipts from other States in the case of apples, sour cherries, eastern grapes, pears, celery, onions, and potatoes, and were less in the case of sweet cherries, peaches, cantaloups, strawberries, cabbage, and tomatoes. The annual consumption in Michigan of the various fruits and vegetables arriving during the local seasons 1930 to 1933 were: Apples 8 percent, sweet cherries 7, peaches 10 (for 1931 and 1933 only), pears 20, eastern grapes 6, strawberries almost zero, cabbage 4, cantaloups 13, celery 4, onions 29, potatoes 7, and tomatoes 1 percent. From 1922 to 1933 there was an increase in the apparent per capita consumption in Michigan of grapes and cabbage and a decrease for apples and pears. That for peaches, cantaloups, and strawberries remained practically unchanged.

The agricultural and industrial demand for corn, G. Shepherd, J. J. Dalton, and J. H. Buchanan (*Iowa Sta. Bul. 335 (1935), pp. 249–295, figs. 9*).—Previous to the World War the trend of corn production in this country was steadily rising. Since 1920, however, it has declined because of decreases both in yield and acreage. From 1900 to 1920, the United States corn crop averaged 68 percent of the world crop. Since the World War, however, the trend has been downward, declining to 55 percent in 1933. During the past 10 yr. gross and net exports of corn from the United States have only once (in 1928–29) exceeded 1 percent of the total crop.

During 1924–29, 86.2 percent of the United States corn crop was fed to livestock on farms. From 1920 to 1935, consumption of corn by horses and mules decreased about 180,000,000 bu. During the past 10 yr. the horse and mule consumption of corn has been cut 40 percent; it now takes only 11 percent of the total corn crop. The consumption of corn by hogs on farms increased 120,000,000 bu. from 1910–14 to 1924–29. It seems likely that, in the future, hog slaughter will increase only slowly, or not at all, over pre-1934 levels, while changes in breeding and feeding methods are likely to continue. The total hog demand for corn, therefore, is not likely to increase much in the future; it may decrease. Consumption by cattle on farms increased 80,000,000 bu. from 1910–14 to 1926–29, because of increases in cattle numbers and perhaps also because of increased dairy production.

The consumption of corn by the milled products industry (makers of corn meal, corn flour, and hominy grits) has been declining, from 200,000,000 bu. before the war to 100,000,000 soon after the war and to 40,000,000 (2 percent of the corn crop) in 1932. The consumption of corn by the corn products industry (makers of cornstarch, corn sirup, corn sugar, and numerous byproducts) has been slowly increasing, until now it accounts for 3 or 4 percent of the corn crop. Present preliminary estimates place the probable outer limits of the consumption of corn as a raw material for corn sugar at about 75,000,000 bu. (3 percent of the total production of corn) more than present consumption for this purpose.

The consumption of corn by the makers of distilled spirits and cereal beverages amounted in the peak year (1917) to 34,000,000 bu. A considerable reduction has taken place since then. Expansion by this industry following repeal can probably increase the demand for corn only about 1 percent.

An interesting possible new use for corn is opened up by the corn-alcohol fuel program. The outer limit of possible use for this purpose is about 600,000,-

000 bu. of corn. Two major difficulties stand in the way of this program: (1) Corn alcohol at the plant costs several times as much per gallon as straight gasoline at the refinery, and it is doubtful whether consumers would pay the extra 2 or 3 ct. a gallon needed for a 10-percent blend, unless they were coerced by some form of tax; (2) other products besides corn would probably be used in some measure unless their use were legally prohibited or made difficult.

The quality of Arizona cotton, R. L. Matlock and J. R. Kennedy (*Arizona Sta. Bul. 150 (1935), pp. 289–351, pls. 2, figs. 9*).—This study was in cooperation with the U. S. D. A. Bureau of Agricultural Economics.

Arizona had a higher proportion of cotton classed Good Middling and above during the 6-yr. period, 1928–33, than the United States as a whole but less than New Mexico or California. Spotted and other colored cotton averaged about 15 percent of the Arizona crop compared with 20.2 percent in New Mexico, 3.6 percent in California, and 15.5 percent for the United States as a whole.

Since 1928 there has been a definite trend in Arizona towards an increased percentage of cotton classed as 1$\frac{1}{16}$ and 1$\frac{3}{32}$ in. and more than 35 percent of Arizona's upland cotton for the 6-yr. period was classed as these lengths, compared with 11.5 percent for the United States as a whole.

Price differentials paid in the various areas of Arizona emphasize the importance of producing cotton of as high grade and staple quality as environmental conditions permit. In the production of Pima cotton, the importance of developing higher standards for picking and ginning the crop and of maintaining supplies of selected planting seed is emphasized.

Marketing fruits and vegetables in Connecticut, G. B. Clarke (*[Connecticut] Storrs Sta. Bul. 205 (1935), pp. 56, figs. 8*).—This study included a survey of retail stores in New Haven and its suburbs, and of peddlers, wholesalers, jobbers, truckers, and farmers who make use of the market. Questions answered by these groups related to buying and selling practices, especially as related to the market, the volume of purchases and sales, farm organization, and other relevant data. Besides a study of the market itself information was obtained about the marketing of fruit and vegetables by farmers in other parts of the State, in order to make clear the position occupied by the New Haven market in the general picture.

There are both morning and night markets in New Haven. Taking the two markets together, the 100 farmers supplying most of the produce sold there reported sales of 31.6 percent of their vegetable acreage to trucker dealers, 20.7 percent to wholesalers, 23.6 percent to peddlers, and 24.1 percent to retail stores. The morning market is a typical city market intended to serve New Haven and its suburbs only. The night market is a surplus market. Most of the buying there is by wholesalers and trucker dealers for resale outside New Haven. Much of the produce bought goes outside the State to New York, Boston, Providence, and other markets, and it is an important outlet for surplus fruit and vegetable production. The only other market in the State serving a similar purpose is the Manchester Producers' Market Association, which so far has been principally an auction market for the sale of strawberries and cauliflower.

Expansion of vegetable acreage in Connecticut is forcing farmers to seek out-of-state markets and to increase their sales to chain stores. Sales in interstate marketing will be promoted by the right kind of market place for that purpose, by standardized packages, and by farmers' conformity to United States grades.

In 1933 Connecticut shipped approximately 600 carlots of fruit and vegetables to New York City alone. Other important out-of-state markets were Springfield, Providence, Boston, and Worcester. Part of this produce moved out through the New Haven market. The larger part was either sold at the farm or trucked out by farmers themselves or by hired trucks.

Advantages of the New Haven market are that it is located in the wholesale district, that it is open at night as well as in the morning, and that it offers an outlet for a large volume of produce. Disadvantages are that it is in private hands outside municipal or farmer control, that it is located on several lots, that it is overcrowded during the height of the season, that access to the market is through heavy traffic in almost every direction of approach, and that charges for parking space are high.

New Haven lies on the edge of a large fruit and vegetable producing section, and it seems probable that a great expansion of the night market will come if proper facilities are provided for the meeting of buyers and sellers.

How Missouri hogs are marketed, F. L. THOMSEN and E. B. SMITH (*Missouri Sta. Bul. 352 (1935), pp. 18, figs. 12*).—This report covers the analysis of hog sales reported by approximately 13,672 corn-hog contract signers in 49 counties of the State. Most of the tabulations cover only the period December 1933 to July 1934, inclusive. Tables and charts show for the State as a whole and by counties the percentages of hogs sold through different market outlets and the average weight of hogs sold, and the seasonal changes in these items. Similar data are also shown for the different public stockyards of the State.

Of the total sales, 53 percent were through public stockyards, 14.2 being sold through cooperative commission firms, 15.8 were shipped direct to packers, and 31.1 were sold through local outlets, 14.1 percent being sold to local livestock buyers. Eighty-one and five-tenths percent of the sales were for slaughter, 17 as feeders, 1.4 for breeders, and 0.1 percent as meat.

A study of the consumption of meats in Minneapolis, 1934, W. C. WAITE and R. W. COX (*Minnesota Sta. Bul. 321 (1935), pp. 26, figs. 8*).—The purpose of this study is to show the variations in the expenditures for, and the consumption of, meat by families in Minneapolis, and to account for the differences. Information was obtained from 2,239 families, which included 8,573 persons. The methods used were similar to those described in Bulletin 311 (E. S. R., 72, p. 714).

Income exercises a predominant influence upon meat consumption. The higher-income groups consumed nearly twice as many pounds of meat and spent nearly three times as much per person for meat as those in the low-income group. This close relationship to income indicates that a revival of business activity, resulting in increased city consumer incomes, would materially benefit the meat producers. It also suggests that, with present levels of income, consumers will react to higher prices either with material decreases in the amounts of meat purchased or with a shift to lower qualities.

In general, race, size, and composition of the family exercise only a minor influence upon consumption.

Crops and Markets, [July–November 1935] (*U. S. Dept. Agr., Crops and Markets, 12 (1935), Nos. 7, pp. 225–304, figs. 4; 8, pp. 305–352, figs. 3; 9, pp. 353–392, figs. 3; 10, pp. 393–440, figs. 3; 11, pp. 441–480, figs. 3*).—Each number includes tables, charts, reports, summaries, etc., of the usual types, covering (1) crop and livestock estimates; (2) market reports for livestock and livestock products, dairy and poultry products, fruits and vegetables, hay, feed and seeds, grains, cold storage holdings, and cotton; and (3) the price situation.

No. 7 includes an article entitled Income From Farm Production in the United States, 1934, in which tables are presented and discussed under the following headings: (1) Income From Farm Production as a Whole in the United States, being estimates based upon all available information bearing on the value of the product of farms of the United States as a producing unit and on the deduction made to arrive at a net income figure; (2) Farm Value of, and Gross and Cash Income From, Farm Production, by States and Commodities, 1932, 1933, 1934, being a compilation of the separate estimates of farm values of 78 crops and 13 livestock items produced in the several States, and the gross and cash income received by farmers therefrom; and (3) Farm Returns 1934, With Comparisons, being a summary of the individual reports of 7,626 owner-operator farmers with respect to the receipts, expenses, and inventory values of their farm business, averaged for geographical divisions.

No. 8 includes the summer sheep, lamb, and wool, dairy, beef cattle, hog, wheat, and poultry and egg outlook reports.

No. 11 includes a brief summary of the agricultural outlook for 1936 noted above.

RURAL SOCIOLOGY

A study of rural society: Its organization and changes, J. H. Kolb and E. deS. Brunner, edited by W. F. Ogburn (*Cambridge, Mass.: Riverside Press, [1935], pp. XIV+642, figs. 45*).—In this text, rural society is stressed as a unit made up of both farmers and villagers and the modern rural community as a town-country community.

Opening with a brief discussion of the nature of rural society, which constitutes the first chapter, the book is organized into five parts. Part 1 considers the group life of rural people, the family, the neighborhood, the village, the community, and the interrelations of town and country as well as rural and urban. Part 2 directs attention to rural people themselves, their origins and characteristics, and the composition of the rural population and its mobility. Part 3 reviews the social economics of agriculture and the institutions associated with farming as a means of earning a livelihood, with special reference to the events of the last few years and the New Deal. Part 4 describes the organization, recent changes, and trends of rural institutions such as the home, school, church, and agencies for recreation, health, and social welfare. In national terms, the apparent trends and possible future policies for rural America are considered in Part 5.

National planning and rural life (*Amer. Country Life Conf. Proc., 17 (1934), pp. [4]+156*).—The papers presented at the American Country Life Association's national rural forum held in Washington, D. C., November 16–19, 1934, at which the general topic was national planning and rural life, were as follows: The presidential address by N. T. Frame on American Country Life Planning (pp. 7–23); When Fortune Favored the Farmer, by C. J. Galpin (pp. 24–32); Reconstructing Our Rural Policy, by C. C. Taylor (pp. 33–38); Planning Agriculture in Relation to Industry, by M. L. Wilson (pp. 39–45); The Agricultural Adjustment Program, by J. R. Hutcheson (pp. 46–64); Agricultural Adjustment and Country Life, by H. R. Tolley (pp. 65–71); Developments in State Planning, by A. R. Mann (pp. 72–84); Educational and Cultural Changes, by E. de S. Brunner (pp. 85–95); International Aspects of National Planning, by W. McClure (pp. 96–107); Population and Occupational Shifts, by O. E. Baker (pp. 108–131); Is There an American Youth Movement? by E. L. Kirkpatrick (pp. 132–141); discussion sessions on youth and national planning for rural life (pp. 142–149); and the annual report of the secretary, in which attention is called to the purposes of the association and the growth of the student movement.

The subsistence homestead program from the viewpoint of an economist, W. E. Zeuch (*Jour. Farm Econ., 17 (1935), No. 4, pp. 710–719*).—Subsistence homesteads are shown to have been an integral part of our national development. Pioneers farmed primarily for home consumption rather than for market. Part-time farming grew up with the development of industry in New England and other sections.

The subsistence homesteads movement represents the first attempt in the United States to promote, finance, and build subsistence homesteads as a part of government policy, though foreign governments, particularly those of Scandinavia, have promoted and financed homesteads.

The author then discusses at length the experiences of the Division of Subsistence Homesteads since its creation as an emergency Government agency.

Social and economic significance of the subsistence homesteads program from the viewpoint of a sociologist, C. C. Taylor (*Jour. Farm Econ., 17 (1935), No. 4, pp. 720–731*).—The author discusses some of the problems involved in the subsistence homesteads program. He emphasizes the need of fact-finding for the guidance of the movement, and he suggests that this program should furnish intelligent guidance as to population trends, who should move to suburban and village homesteads, and who should set up subsistence homesteads and how. The conclusion is reached that the subsistence homesteads program and large segments of the rural rehabilitation program as well constitute a giant experiment in social engineering. He grants that such large undertakings are both difficult and precarious and might be more harmful than good unless wisely guided, that homesteaders cannot be handled as experimental animals, and that these new communities must be part and parcel of the larger local communities to which they belong. Those who move into them must really want to do so and they, in turn, must be wanted by the larger community.

Part-time farming in Connecticut: A socio-economic study of the lower Naugatuck Valley, L. A. Salter, Jr., and H. D. Darling (*[Connecticut] Storrs Sta. Bul. 204 (1935), pp. 79, figs. 9*).—The purpose of this study, conducted in cooperation with the Federal Emergency Relief Administration and a continuation of earlier work (E. S. R., 73 p. 709), was to determine what socio-economic factors should be considered in the development of a program of part-time farming in the lower Naugatuck Valley. Attention is called to the importance of administrative, political, theoretical, and engineering problems connected with planning part-time farming. Among phases discussed are the historical background and surveys of agriculture, industry, urban families, and social facilities.

Although on the basis of the data presented, "it appears that a part-time farming program could make considerable progress toward improving social conditions in the area," it is stated that the development of such a program "should take place only after careful consideration of the social and economic organization of the area to be affected and of the results of other studies of the part-time farming movement and only after definite decisions have been made with relation to the fundamental policies and objectives of the program. And finally, the ultimate success of any program, however well conceived, depends upon efficient and well-informed administration."

The social effects of land division in relationship to a program of land utilization, T. L. Smith (*Jour. Farm Econ., 17 (1935), No. 4, pp. 702–709, figs. 2*).—Louisiana is said to furnish an excellent example of the need for a rational program for bringing about a more equitable adjustment between the population and the land. Some 500,000 acres of land in the rich delta "sugar bowl", which produced abundant crops but a few decades ago, now lie idle, uncultivated, and neglected.

The author sets forth the advantages and disadvantages inherent in the customary checkerboard system of land division in its effect on rural life and community development.

Features of social life in Iowa, V. Hussey and L. Foster (*[Ames]: Iowa State Planning Bd., 1935, pp. [4]+61, [figs.] 41*).—In this report basic data on the social characteristics of the various sections of the State are presented.

The southern part is less developed socially and economically than the remainder of the State. The northern part is more advanced economically but has not shown corresponding social development. Central Iowa and many of the border counties of the west and east are the most highly developed areas from the social point of view.

The amount of participation in social organizations; number of marriages, divorces, and deaths; extent of education; and growth of population are greater in proportion to total population in the urban than in the rural areas.

The population density per square mile for the State as a whole is 44.5 persons compared with a range of from 22.3 in Davis County to 297 in Polk County. Thirty of Iowa's 99 counties are entirely rural, having no towns of 2,500 or more. Of the total population, 39 percent live on farms and 21.3 percent in rural nonfarm districts, leaving 39.7 percent in the urban districts of 2,500 or more; 37.2 percent are under 20 yr. of age. Generally, the northwest section has the youngest population and the southeast the oldest. Of the total population of the State, 44.1 percent are married. The rate of divorces is definitely higher in urban than in rural counties. The annual average birth rate, 1924–30, was 101.2 per 1,000 female population 20–45 yr. of age, while the death rate was 10 per 1,000 population.

Other phases analyzed are education, participation in rural organizations and politics, deaths from communicable diseases, number of defectives, crime and delinquency, and unemployment and relief. The report is illustrated by 41 charts.

A social study of the Blacksburg community, W. E. Garnett (*Virginia Sta. Bul. 299 (1935), pp. 105, figs. 18*).—This report is based mainly on data obtained from 1,259 of the 1,600 families in the Blacksburg community area. The community is approximately 20 by 8 miles in area. The town of Blacksburg is the center. The area, which includes the Roanoke Valley, is bordered by several mountain ranges averaging about 2,400 ft. elevation. In addition to farming, coal mining and the quarrying of sandstone, limestone, and buhrstone are the principal industries. The normal rainfall, temperature, and growing season are adequate for crop production. The community is fairly well provided with transportation facilities.

Practically half of the people of the area are of the marginal to submarginal type. Marginal homes average 6.4 children per family compared with 1.7 in homes of higher standards. Nevertheless, the community is evidently improving economically and educationally, and the sense of responsibility for its less fortunate members has quickened.

In the past 50 yr. 577 sons and daughters of the Blacksburg community have migrated to 36 other States, 5 foreign countries, and 30 other Virginia counties.

The past 5 yr. of depression have greatly reduced incomes and living standards which at best did not average satisfactorily. Housing conditions are submarginal for approximately half of the country families and one-fourth of those in town. A high percentage of children of marginal families are suffering from malnutrition. Many families are unable to pay for medical treatment. Recreational needs of the marginal groups are largely unmet, and educational facilities are not up to the standard to be expected in a community of this type. Much of the school work is poorly related to real needs. Vocational education and guidance for those who do not go to college and are not to engage in farming are inadequate.

The area is greatly overchurched, yet the churches are failing to reach a high percentage of the people. Less than half of the potential voters take part in elections. The system of tax assessments needs improvement. Relations between whites and negroes are especially good, yet a feeling of loyalty to and responsibility for the whole community is lacking both in town and country.

Social problems of rural people (*Wisconsin Sta. Bul. 430 (1935), pp. 150–152, 154–156*).—Data are reported as to the needs of Wisconsin rural families receiving public relief, by E. L. Kirkpatrick and C. F. Kraenzel, and social opportunities among rural young people, by Kirkpatrick.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Summaries of studies in agricultural education (*U. S. Dept. Int., Off. Ed., Vocat. Ed. Bul. 180 (1935), pp. V+196*).—This is an annotated bibliography of 373 studies in agricultural education in which the purpose, methods, and findings and interpretations of each study are set forth. It was prepared by the research committee of the agricultural section of the American Vocational Association. Also included are an introductory statement by R. M. Stewart, chairman of the committee, and an article by F. W. Lathrop on evaluation of studies in vocational agriculture, which discusses the characteristics of a study qualifying as a scientific piece of work.

Federal cooperation in agricultural extension work, vocational education, and vocational rehabilitation, L. E. BLAUCH (*U. S. Dept. Int., Off. Ed. Bul. 15 (1933), pp. XII+297*).—"Much information collected from widely scattered sources is here made available on (a) the social, economic, and educational background out of which came the movement for these forms of Federal participation in education, (b) the enactment of the legislation, and (c) the organization and operation of the systems of agricultural extension work, vocational education, and vocational rehabilitation. Thus, the study reported in this bulletin contributes not only to educational history but to an understanding of present-day questions. The bulletin should prove useful to students of education, sociology, economics, and government, and to other persons interested in the development of national policies in education."

Appendixes include the various Federal laws, tables showing by years the Federal appropriations for agricultural and home-economics extension work, vocational education, and vocational rehabilitation. A bibliography is also included.

A history of the extension service of Iowa State College, R. MORGAN (*Ames: Collegiate Press, Inc., 1934, pp. VIII+107, [pls. 6, figs. 3]*).—The movements leading up to the creation of the extension service in Iowa, its development, and status in 1930, are covered.

4–H club study points out trends of member interest (*Illinois Sta. Rpt. 1934, pp. 10–13*).—Data on intelligence, age, achievement, attitude, and number of years in club work in the State, collected by H. W. Mumford and D. E. Lindstrom, are summarized and discussed.

A guide to the teaching of home economics.—I, Beginning foods, C. B. MILLER, R. J. FRIANT, and M. E. TURNER (*Ames, Iowa: Collegiate Press, Inc., 1934, pp. IV+60, figs. 2*).—This is the first in a series of publications prepared to guide high school teachers in planning methods of teaching home economics. Suggestions are made for teaching an introductory unit, a food unit, and a hospitality unit.

FOODS—HUMAN NUTRITION

[Food studies at the Illinios Station] (*Illinois Sta. Rpt. 1934, pp. 250–255, figs. 2*).—This progress report (E. S. R., 70, p. 713) deals with studies by S. Woodruff on the properties of wheat flour desirable for cake baking, gelatinization changes in wheat starch, new methods of making starch from corn, and the cooking qualities of different varieties of soybeans.

The liver oil of Norway haddock (Sebastes marinus), T. Thorbjarnarson (*Analyst, 60 (1935), No. 713, pp. 525–528*).—This paper reports physical and chemical constants for the liver oil obtained by steam treatment from haddock (*S. marinus*) caught off the coast of Iceland in September 1934 and similar values for a sample of haddock-liver oil obtained from an industrial source. Data are also reported on the vitamin A content of the freshly prepared oil and its unsaponifiable fractions as determined by spectroscopic assay.

The oil had a higher iodine value and a smaller proportion of unsaponifiable matter than reported by Haines and Drummond (E. S. R., 69, p. 465) for halibut-liver oil. The values for vitamin A in the freshly prepared oil and its unsaponifiable matter are given as 1.14 and 29.6 percent, respectively. The unsaponifiable material was found to consist mainly of cholesterol and vitamin A, together with small amounts of squalene, an unsaturated alcohol possibly related to vitamin A, and possibly a saturated hydrocarbon.

The examination of a number of samples of haddock-liver oil for vitamin A content, chiefly by the antimony trichloride reaction, showed wide variations. "It is highly probable that these variations can be correlated, as in the case of other fish-liver oils, with the age and sex of the fish, its physiological condition, and the nature of its food supply."

The composition of raspberries, T. Macara (*Analyst, 60 (1935), No. 714, pp. 592–595*).—Analyses for percentage of soluble and insoluble solids, number and weight of seeds in 100 g, and percentage of free acid as hydrated citric acid are reported for 24 samples of raspberries of 4 different varieties grown in England and Scotland in the summer of 1934, under drought conditions in England but chiefly normal moisture conditions in Scotland.

The data indicate that wetness or dryness of climate had little or no influence on the amount of insoluble matter in the fruit, which depended rather on (1) the variety, (2) soil or other horticultural factors, and (3) the length of time the fruit was on the cane. The soluble solids were affected by climate, the English berries grown under drought conditions containing from 10.9 to 12.2 percent and the Scotch berries only from 6.5 to 9.2 percent. The differences are thought to be due to the effect of sunshine in ripening the English fruit rather than the dilution of the Scotch fruit because of moist conditions. The acidity of the fruit remained remarkably uniform throughout the entire series, ranging between 1.5 and 1.9 percent.

The data are discussed chiefly from the standpoint of legal standards for jam manufacture.

How much sugar in fruit jellies? G. L. Baker (*Food Indus., 7 (1935), No. 4, p. 170, fig. 1*).—The author, at the Delaware Experiment Station, has developed an equation for calculating the sugar requirement and jelly yield of a fruit juice extraction from its determined viscosity. The general equation is log $y=ax+b$ where y = the relative viscosity of the extraction juice at 80° F. and x = the parts of sugar per part of juice by weight which must be added. The values a and b are constants which vary with the desired firmness of the jelly. The values are 0.675 and 0.236 for a tender jelly, 0.833 and 0.195 for a slightly firmer jelly (jelly strength 40), and 1 and 0.15 for a jelly meeting the commercial requirement of a jelly strength of 50 or slightly above. The values and equations are said to have been used successfully in household recipes where a pound of juice was made into jelly and in commercial recipes using 100 lb. of juice.

The quantity of jelly to be produced from an extracted fruit juice of a certain viscosity can be calculated from the same general formula by introducing another constant c for the percent added sugar in the finished jelly and substituting for x the value z which = the parts by weight of finished jelly per part of juice. This formula is $\log y = acz + b$.

The constant a varies from 0.6 to 0.65, depending upon the natural fruit sugars in the juice. On increasing the percentage of added sugar, the constant a must be lowered to maintain the same strength of the finished product, while the constant b remains more or less unchanged. If pectin is added the formula is applied after its addition.

"The use of this formula in computing the sugar requirement and the resulting jelly yield of a fruit juice extraction assures the user, whether he be making jelly in the home or in the factory, of a uniform strength of his jelly product. Soft sirupy jelly, resulting from using too much sugar for the pectin requirement or from insufficient cooking, need no longer be made."

Pectin content of raw material: Optimum conditions of extraction determined by viscosity, G. L. BAKER and R. F. KNEELAND (*Fruit Prod. Jour. and Amer. Vinegar Indus., 14 (1935), No. 7, pp. 204, 205, 210, 220, figs. 2*).—In this contribution from the Delaware Experiment Station a method is described for determining the optimum point of extraction of pectin from jelly-making materials. The method, which offers an easy means of detecting any increase in yield caused by variations of time, temperature, or pH, consists essentially in a check on the jellying quality of a pectic extraction by viscosity measurements, viscosity being used as a measure of the quantity of jelly units present in a pectic extraction. A special capillary pipette with a flow period for water of 12.6 sec. at 26° C. is used for the viscosity determinations. The method is illustrated by two series of extractions on five different pectic-containing materials. A formula has been developed for the calculation of jelly units present in a pectic-source material.

A new method for jelly testing (*Fruit Prod. Jour. and Amer. Vinegar Indus., 14 (1935), No. 10, p. 305, fig. 1*).—As an outcome of the above-noted studies at the Delaware Experiment Station, the senior author has developed a simple viscosity pipette, known as the "jelmeter", which can be used by the jelly manufacturer or the homemaker to determine the amount of sugar to be added to an extracted fruit juice to obtain a good quality jelly. From the time in minutes required for the juice at room temperature to flow from the upper mark to the lower mark of the pipette, the quantity of sugar to add for each pound of juice can be read from a table which also gives the end point of cooking in terms of the weight of jelly for each pound of extracted juice.

Microbiology of frozen foods.—III, Longevity of pure cultures of micro-organisms frozen in various menstra, G. I. WALLACE and F. W. TANNER (*Fruit Prod. Jour. and Amer. Vinegar Indus., 14 (1935), No. 8, pp. 235–237*).—Pure cultures of 16 micro-organisms were isolated from cans of frozen fruits and vegetables and grown on agar slants, the growths suspended in various types of nutrient media, including sweetened and unsweetened cherry juice and strawberry juice, and the suspensions sealed in 2 cc sterile ampoules, which were then stored at −23.3° C. (−10° F.). At monthly intervals the numbers of viable organisms were determined by plating on agar.

In all cases there was a rapid drop in numbers during the first months of freezing, after which there was a slower decrease. The organisms died out rapidly in the fruit juices and somewhat less rapidly in plain broth with a similar acid reaction. Different concentrations of salt and sugar did not notably affect the decrease. There was some indication that molds and moldlike organisms were more resistant than bacteria to the combination of cold and acid.

In other tests alternate freezing and thawing proved no more destructive to micro-organisms than continuous freezing, and temperatures as low as —40° C. were no more lethal than temperatures just below freezing.

Fields of research in nutrition, L. B. Mendel (*Jour. Home Econ.*, *27* (*1935*), *No. 7, pp. 415–420*).—In this lecture, delivered before the section on foods and nutrition of the American Home Economics Association at its 1934 meeting, the author suggested various problems for needed research in nutrition. Among these are food requirements "in harmony with a changing world", the role of various vitamins in maintaining health, the establishment of better indices of adequate antiscorbutic protection for man, storage facilities of the body for essential food constituents, the fate of organic acids in the body, and food allergy.

[Nutrition studies at the Illinois Station] (*Illinois Sta. Rpt. 1934, pp. 78–85, 248–250, 261, 262*).—Progress reports (E. S. R., 70, p. 716) are given on studies under the direction of H. H. Mitchell on the nutritive value of corn sugar as compared with cane sugar and of the proteins of nuts as compared with meats (pp. 78–82); by B. W. Fairbanks on the nutritive values of dried skim milk prepared in various ways (pp. 82–85); by C. R. Meyer on oats and lettuce as carriers of the needed factor for lactation (pp. 248, 249); by J. Outhouse and J. Smith on the role of lactose in nutrition (pp. 249, 250); and by Outhouse and R. Krouse on the effects of lysine deficiency in nutrition (pp. 261, 262).

[Studies in nutrition at the Wisconsin Station] (*Wisconsin Sta. Bul. 430* (*1935*), *pp. 102, 103, 122–131, 135–137, 142, 143*).—Included in this progress report are summaries of studies, several of them representing extensions of earlier work (E. S. R., 72, p. 559), by H. J. Gorcica on the nutritive value of the mycelium of *Aspergillus sydowi* (p. 102); by F. Quackenbush and H. Steenbock on the nutritive value of mushrooms (p. 102); by H. Bird and R. L. Hutchinson on the vitamin B_1 and B_2 potency of different strains of yeast and the same strains grown on different media (pp. 102, 103); by W. C. Sherman, C. A. Elvehjem, and E. B. Hart on the availability of iron in various foodstuffs and of copper in various pure copper compounds (pp. 122, 123); by Elvehjem assisted by E. Cohen on the mechanisms by which copper exerts its influence with iron in promoting hemoglobin formation (pp. 123, 124); by Steenbock, E. C. Van Donk, and H. Feldman, with the cooperation of E. F. Schneiders, on the anemia of pregnancy in the human (pp. 124, 125); by P. H. Phillips, Hart, and G. Bohstedt on the public health aspects of the use of phosphorus with reference to the possibility of harmful increases in the fluorine content of crops grown on soils thus fertilised and of drainage water (pp. 125–127); by Steenbock, with the cooperation of M. H. Irwin, A. R. Kemmerer, V. M. Templin, and J. H. Weber, on the needs of the body for fats and the nutritional value of different fats (pp. 127–129); by J. T. Lowe and Steenbock on the effectiveness of various sources of phosphorus in the nutrition of young animals (p. 129); by Elvehjem, W. H. Uphoff, Hart, H. C. Jackson, and K. G. Weckel on the comparative nutritional value of raw and pasteurised milk (pp. 129–131); by D. L. Hussemann on vitamin C in home canned tomato juice (pp. 135, 136); by F. C. Schoenleber and Steenbock on the possibility of injury when irradiated foods make up the entire ration (p. 136); by R. W. Haman and Steenbock on the spectroscopic measurement of vitamin D (pp. 136, 137); and by H. T. Parsons, J. G. Lease, and E. E. Kelly on the nature of the protective food factor against egg white injury (pp. 142, 143).

Weight loss changes during muscular work following food ingestion, C. I. Hovland (*Amer. Jour. Physiol., 112 (1935), No. 2, pp. 307–309*).—Following the same methods as in an earlier study in which weight loss (insensible perspiration) was used as a measure of metabolism (E. S. R., 74, p. 279), the author has determined the relative weight losses in doing an equivalent amount of work at various intervals following the ingestion of large and small meals, the task consisting of flexing and reflexing the index finger of the left hand as rapidly as possible. The subjects were 10 normal healthy men ranging in age from 18 to 34 yr., in weight from 132 to 178 lb., and in height from 64 to 71 in. The meals were given at 12 o'clock noon, and the weight-loss readings taken hourly for 5 hr., the first one immediately preceding the meal.

The increase in weight loss per unit time during work over that during relaxation was found to be higher after the heavy meal than the light, the advantage of the light meal being most marked in the earlier part of the afternoon, immediately after eating. The greatest inefficiency from the standpoint of energy expenditure occurred in the late afternoon about 4 hr. after eating. This was followed by an increase in efficiency at the conclusion of the work, this being attributed to relief at the end of the day's work.

Effect of a diet poor in salts upon the growth and composition of the incisors of the rat, M. F. Clarke and A. H. Smith (*Amer. Jour. Physiol., 112 (1935), No. 2, pp. 286–293*).—This study was undertaken to determine to what extent changes occur in the teeth of rats kept on a ration adequate except for mineral salts, which were reduced to a minimum, and to discover whether such changes as occurred could be reversed by introducing the lacking elements into the diet. Rats were placed on the experimental diet at 35 days of age and weighing about 100 g. Some were sacrificed at the end of 3, 6, or 12 weeks and others continued after these intervals on the same diet supplemented with adequate mineral salts. Two types of controls were used—(1) age controls, consisting of litter mates of the rats on the low salt diet, fed an adequate synthetic diet ad libitum and (2) calorie controls, also fed the adequate diet but restricted in calories to the consumption of the experimental animals. At the end of the experimental periods, the animals were killed and weighed and the upper incisors weighed and analyzed for moisture and ash.

The fresh weights of the incisors were less than that of either type of control, but the differences were much less marked than the differences in body weights. Relatively slight changes in composition of the incisors occurred during the first 3 weeks on the low salt diet, after which there was a relative and absolute increase in moisture and a relative decrease in ash content. In the animals continued on the same diet plus 4 percent adequate mineral salts, there was an acceleration of the growth of the teeth and the ash content returned to normal values.

The authors conclude that "the ash of the incisors is relatively stable compared to that of the bones; ash is deposited in the growing incisors while it is withdrawn from the bones, under the adverse dietary conditions used in these experiments."

Amount of haemoglobin in the blood, E. R. Holiday, P. M. Tookey Kerridge, and F. C. Smith (*Lancet [London], 1935, II, No. 12, pp. 661–665, figs. 2*).—This paper discusses critically the hemoglobinometers in present use and the methods by which they are standardised and the hemoglobin values expressed, and describes in detail the construction and operation of a photoelectric apparatus capable of measuring the relative amounts of hemoglobin in different samples of blood and suitable for routine use.

The method makes use of the intense Soret absorption band on the border of the ultraviolet instead of the better known α and β bands. "It depends upon a physical property of oxyhemoglobin the measure of which is permanent, capable of exact assessment and of being used as a reference standard for other forms of hemoglobinometer."

Respiratory metabolism in infancy and in childhood.—XV, Daily energy requirements of normal infants, S. Z. Levine, T. H. McEachern, M. A. Wheatley, E. Marples, and M. D. Kelly (*Amer. Jour. Diseases Children, 50 (1935), No. 3, pp. 596–620, figs. 4*).—This continuation of a series of papers, some of which have been noted previously (E. S. R., 66, p. 386), reports daily balance studies of protein, carbohydrate, fat, and calories on 3 healthy infants (2 negro and 1 white) from 4 to 9 mo. of age while on basal, normal, and high caloric and low fluid diets. The basal diets were calculated to furnish the same number of calories as the basal metabolic rates predicted from standards based on height and weight and in the case of one of the subjects, his own directly measured basal metabolic level.

Under conditions of limited physical activity, the daily requirements were covered by 73, 82, and 94 calories per kilogram of body weight on the basal, normal, and high caloric diets, respectively, these figures representing metabolic accretions of 26, 41, and 63 percent above the respective basal levels. On the so-called normal diets, which closely resembled those in common infant feeding practice, the apportionment of the total daily catabolism was estimated to be as follows: "Basal quota, 57 calories per kilogram of body weight, or 70 percent of the total exchange; specific dynamic action of food, 7 calories, or 9 percent; activity quota, 8 calories, or 10 percent; and loss in feces, 9 calories, or 11 percent.

The reduction of the fluid intake of one of the subjects with subsequent rise in body temperature to 101.7° F. (rectal) resulted in an extra expenditure of 10 calories per kilogram in 24 hr., or 14 percent above the established metabolic level in the absence of fever.

"All the infants maintained positive caloric balances on the normal diets, and their growth quotas while they were on these diets were represented by the deposition within the organism of organic substances in proportions and quantities compatible with the building up of appreciable amounts of protoplasmic tissue. The evidence indicates that the customary diets employed in infant feeding, which contain approximately 110 calories and from 4 to 5 g of protein per kilogram of body weight, are calorically and organically adequate to insure proper development, as determined by the amount and character of the materials made available to the infantile organism for the body growth of infants on these diets."

Clinical and anatomic study of avitaminosis A among the Chinese, L. K. Sweet and H. J. K'ang (*Amer. Jour. Diseases Children, 50 (1935), No. 3, pp. 699–734, figs. 10*).—This extensive report is based upon the examination of 203 Chinese patients suffering from vitamin A deficiency and the pathological material from 17 autopsies and 22 biopsies on these patients. The findings are discussed, with numerous references to pertinent literature, from the standpoint of etiology, pathology, symptomatology, physical examination, complications, diagnosis, and treatment. Several case reports are given in illustration of the great variability in the pathological processes and symptoms.

Attention is called to the fact that while in experimental animals in which a single factor can be varied in the diet the effects of this factor can be studied with precision, in human beings who select their diets this is impossible. "Consequently it will be possible to give the exact histologic sequences and relationships in human avitaminosis A only after a very large series of patients has been studied in detail. This can be done best by the cooperative efforts of an ophthalmologist, an internist, and a pathologist in a center in which vitamin A deficiency is endemic."

The vitamin B and G content of Arizona-grown grapefruit and broccoli, G. H. ROEHM (*Jour. Home Econ., 27 (1935), No. 10, pp. 663–666, figs. 2*).—Sherman unit values are reported for the vitamin B and G content of various portions of Arizona-grown grapefruit and broccoli as follows:

Vitamin B, grapefruit pulp 0.16 and fresh peel 0.28 and broccoli flower 0.66 and leaf 0.5 unit per gram and vitamin G, grapefruit pulp 0.4, fresh peel 1, and boiled peel 0.5 and broccoli flower 4 and leaf 3 units per gram. The practical significance of these results is summarized as follows:

"Grapefruit pulp and peel are neither of them good sources of vitamin B, but both are good sources of vitamin G, though the peel is eaten in too small quantities to be of great practical importance. Broccoli compares with most leafy vegetables as a source of vitamin B and is exceptionally rich in vitamin G. Both vitamins seem to be more abundant in the flower than in the stem."

The histochemistry of the adrenal gland.—I, The quantitative distribution of vitamin C, D. GLICK and G. R. BISKIND (*Jour. Biol. Chem., 110 (1935), No. 1, pp. 1–7, fig. 1*).—The histochemical method for the quantitative determination of vitamin C, noted on page 449, has been used to determine the concentration of vitamin C in various parts of the beef adrenal, and the results obtained have been correlated with the number and types of cells throughout the gland.

The most active fascicular zone was found to correspond "to the greatest concentration of cells, while the least active medulla contains the smallest concentration of cells. However, the smaller fascicular cell still contains more vitamin than the medullary cell."

The influence of vitamin C on metabolism [trans. title], F. STRIECK (*Biochem. Ztschr., 277 (1935), No. 3–4, pp. 279–283*).—Data are reported on the oxygen consumption of dogs and human subjects following the administration of ascorbic acid by mouth and by subcutaneous and intravenous injection.

A varied response, not correlated with dose or manner of administration, occurred in both dogs and human subjects. No increase took place in subjects with a heightened basal metabolism. The respiratory quotient was in no case significantly altered.

Rheumatic heart disease and vitamin C, C. B. PERRY (*Lancet [London], 1935, II, No. 8, pp. 426, 427*).—Data are reported for 5 active and 6 quiescent cases of rheumatic heart disease in children on the excretion of ascorbic acid in the urine in 12 hr. after a test dose of vitamin C according to the method of Harris and Ray (E. S. R., 73, p. 427) and on the capillary resistance as determined by the Göthlin method (E. S. R., 72, p. 422).

Of the 5 active cases, 3 showed a marked increase in the excretion of ascorbic acid following the test dose, an indication of saturation of vitamin C. The other 2 showed no response until after vitamin C treatment, in 1 case with ascorbic acid 0.5 g daily for 8 days and in the other a full diet for nearly a month. All had normal capillary resistance according to the Göthlin test. Of the 6 quiescent cases, 3 showed a satisfactory rise in the excretion of vitamin C immediately and the others not until after vitamin C therapy. The capillary resistance test was normal in all but 1 case.

These findings are thought to afford no support for the theory of Rinehart and Mettier (E. S. R., 71, p. 428) that vitamin C deficiency plays an important role in the causation of acute rheumatism and to cast doubt on the reliability of the capillary resistance test as a delicate index of vitamin C deficiency, but to suggest that "some degree of vitamin C deficiency is not uncommon amongst children with active and quiescent rheumatic carditis."

Botulism (*Lancet [London], 1935, II, No. 10, pp. 559, 560*).—The rarity of botulism in England is shown in this editorial calling attention to the deaths of four people from botulism attributed to nut brawn, a vegetarian product made in London and put up in glass containers. It is noted that a period of 13 yr. had passed with no officially reported cases of botulism in the British Isles between the Loch Maree cases in 1922 (E. S. R., 50, p. 167) and the present outbreak.

A case of botulism, with a note on the bacteriological examination of the suspected food, C. Rickword Lane and T. E. Jones-Davies (*Lancet [London], 1935, II, No. 13, pp. 717, 718*).—This is a brief report of one of the fatal cases of botulism noted above.

The allergic factor in the aetiology of non-specific colitis, D. C. Hare (*Lancet [London], 1935, II, No. 14, pp. 767, 768*).—A study of the allergic histories of a group of 38 patients suffering from nonspecific colitis has led to the theory, given support by many points of similarity between the two conditions, that the allergic factor plays a part in the etiology of nonspecific colitis.

The treatment of obesity, J. H. Anderson (*Lancet [London], 1935, II, No. 11, pp. 604–607*).—This discussion, based largely upon the author's experience in active hospital treatment, deals with the treatment of obesity through two major lines of attack (diet and exercise) and two minor lines (drugs and physical treatment). Standard reduction diets and food lists used in the author's hospital are given, together with instructions to patients on leaving the hospital. Considerable attention is given to carefully prescribed exercise and to methods of improving the mental outlook of the patients. "As a rule they are outwardly cheerful, but when their confidence is gained it is generally found that they regard their disability more anxiously and resentfully than appears to the casual observer."

TEXTILES AND CLOTHING

A study of popular-priced white broadcloth shirts, E. L. Phelps and E. R. Gorham (*Jour. Home Econ., 27 (1935), No. 9, pp. 593–600*).—In this study at the Minnesota Experiment Station, 11 white broadcloth shirts for men were purchased in duplicate at retail from different types of stores in Minneapolis and St. Paul in the spring of 1933 and examined for measurements as compared with suggested standards, the character of fabric and type of construction, and the effect of laundering. The shirts, all of which were made of mercerized white broadcloth in the same general style, were purchased in size 15 with different stated lengths of sleeves. Nine cost from $1.44 to $1.65 and 2 about $2 each. Eight were advertised as preshrunk and 2 as Sanforized.

The suggested standards used for comparison were the recommended standards of the U. S. Bureau of Standards[2] and a list by C. L. Simon[3] of certain features required in the so-called "perfect" shirt, these being "(1) lustrous, high-count broadcloth, 100 percent preshrunk; (2) tensile strength, 75 lb. in the warp, 30 lb. in the filling; (3) zero shrinkage in the neckband; (4) not more than ¼ in. shrinkage in sleeve length; (5) approximately 24 stitches per inch in sewing; (6) deep armhole; (7) 7 ocean-pearl buttons stitched 4 ways."

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[2] Recommended Commercial Standard for Men's Shirts (Exclusive of Work Shirts). U. S. Dept. Com., Bur. Standards, 1932, TS–1658, pp. 6, figs. 2.

[3] Retailing, Exec. Ed., 5 (1933), No. 41, p. 5, fig. 1.

Only 3 of the 22 shirts examined met the proposed commercial standards in every measurement. These were 2 shirts of a brand selling at $1.65 and 1 of the $1.95 shirts. Among the shirts selling at about $1.50, total chest circumference and width of sleeve were the 2 measurements which most commonly failed to meet the standards. The collarbands of all of the shirts were longer than the marked size, varying from 15¼ to 15⅝ in.

One shirt of each pair was measured after being washed 3 times and then ironed in a steam laundry and after a total of 25 washings and 2 ironings. After the final laundering the neckbands of 3 of the $1.50 and the 2 $2 shirts measured longer than 15 in., and of the others 3 were less than 15 and 8 exactly 15 in. The sleeve lengths fell below standard for all but 4 of the $1.50 and 1 of the $2 shirts. In 1 shirt the sleeves were 2 in. shorter than the stated length. In the recommended commercial standards, preshrunk is defined as applying to the entire garment and indicating a shrinkage not exceeding 2 percent when properly laundered. After 25 washings, only 1 shirt (price $1.95) met the definition at every point measured, while 1 costing $1.65 and 1 $1.99 met the definition at all points except collarband.

No consistent difference was found in the 2 price ranges in regard to the character of the fabric. In both groups, both single- and 2-ply yarns were used, and similar values for tensile strength in both directions, similar changes in strength after laundering, and about the same variation in number of warps and fillings per inch and in thickness were found. There were no marked differences in construction between the 2 price groups except a greater uniformity in the stitching in the $2 group. No outstanding differences could be observed in shirts purchased from locally owned stores and from some type of chain stores.

Not one of the entire number of shirts met all of the specifications of a perfect shirt as proposed by Simon.

Effect of wear and laundering on cotton sheeting, L. B. Bailey (*Textile Res., 5 (1935), No. 6, pp. 263–274, figs. 14*).—Ten cotton sheets 90 by 108 in. were put into service as the lower sheets of double beds used by two people. The sheets were laundered weekly at a commercial laundry by a standard washing procedure, and chemical and physical tests were made on them at successive wear intervals.

The sheets became wider and shorter with length of service, increasing about 6 percent in width and decreasing about 8 percent in length during 44 weeks of continuous wear. This is attributed to ironing the sheets from selvedge to selvedge, with resulting greater strain on the filling threads. Failure of the sheets in all cases was due to lengthwise tears, indicating weakening of the filling yarn.

All of the physical properties—strength, weight, thickness, and air permeability—and the chemical properties were more adversely affected in the areas exposed to greatest wear. This shows that in considering durability of sheets the effect of wear or actual abrasion should be considered as well as laundering. It is noted that a retail firm recently announced that its sheets had been laundered 364 times before being worn out but that the sheets were not actually placed in service. The results in the present study and similar studies by the U. S. Department of Agriculture (E. S. R., 71, p. 429) indicate that "the effect of abrasion or wear is a most important factor in determining the wear-life of a sheet. Under the conditions of wear and laundering described in this paper, it was found that the sheets were worn out at the end of about 50 weeks' service."

Methylene blue absorption as a quantitative measure of wool damage, R. E. Elmquist and O. P. Hartley (*Textile Res., 5 (1935), No. 3, pp. 149–156,* *figs. 4*).—In connection with a study at the U. S. D. A. Bureau of Home Economics of the chemical changes occurring in woolen blankets as a result of wear and laundering, a simple titrimetric method of measuring such changes by the absorption of methylene blue from buffered solutions of the fabric has been developed. The method, which is described in detail, is said to give accurate reproducible results and to be suitable for use on fabrics, raw wool, and dyed and undyed materials. As enough material for analysis, 0.1 g, can be cut from seams, the method can also be used for finished garments.

"Experimental results are given for material damaged progressively under controlled conditions of laundering, and for fabrics containing wools of different grades and different dyeings. A linear relationship was found to exist between absorption and tensile strength. The reworked wool that was tested absorbed nearly four times as much methylene blue as the new serge used in the experiments. Optimum test conditions were determined and are discussed critically."

HOME MANAGEMENT AND EQUIPMENT

[Food consumption of farm families in 1929 and 1933] (*Wisconsin Sta. Bul. 430* (*1935*), *pp. 152–154*).—This progress report summarizes the results of a comparison of the food consumption habits of 314 rural families in three counties of Wisconsin in 1929 and 1933 by M. L. Cowles, M. A. Mason, and J. M. Striegl.

More money available for family spending in 1933–34 (*Illionis Sta. Rpt. 1934, pp. 255–261, fig. 1*).—This progress report in continuation of the home account studies by R. C. Freeman and P. Nickell (E. S. R., 70, p. 730) summarizes the expenditures for 1933–34 of 167 farm families and compares these expenditures with corresponding items for 159 farm families for 1932–33 when on the average less money was available for family spending. Tabulated data are included on the average distribution of realized income and of cash expenditures of the 167 families in 1933–34.

MISCELLANEOUS

A year's progress in solving farm problems of Illinois: [Forty-seventh Annual Report of Illinois Station, 1934], compiled and edited by F. J. Keilholz (*Illinois Sta. Rpt. 1934, pp. 287, figs. 47*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Science safeguards crops, livestock, farm income: Annual report of the director, [Wisconsin Station, 1934], compiled by N. Clark (*Wisconsin Sta. Bul. 430* (*1935*), *pp. 167, figs. 34*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

NOTES

Arkansas University and Station.—Recent appointments include Dr. Isabella C. Wilson, management supervisor of the Housing Division of the U. S. Public Works Administration, as head of the department of home economics; B. H. Mewis, as assistant agricultural editor; and Thomas W. Douglas and Dr. Kenneth H. Hunter of the U. S. Federal Trade Commission as assistant economists for research in transportation, marketing, rail and truck freight rates, and farm credit and farm insurance.

California University and Station.--Instruction in home economics has been instituted at Davis in charge of Dr. Harriet Morgan, and the staff is also undertaking a program of research.

The division of viticulture and fruit products has been reorganized into two divisions—fruit products, in charge of Dr. W. V. Cruess, with headquarters at Berkeley, and viticulture, in charge of Dr. A. J. Winkler, with headquarters at Davis. A major undertaking of the division of viticulture will be the production of several hundred samples of natural wines derived from numerous varieties of grapes and replicated for different ecological conditions in the various production centers of the State. Basic information, both biological and chemical, will be obtained from these samples from the time of harvest to the aged wine for study of factors influencing quality in wines.

Idaho University and Station.—H. W. Hulbert, head of the department of agronomy, resigned January 1 to engage in commercial work and was succeeded February 1 by Dr. K. H. Klages, associate professor of agronomy and associate agronomist in the South Dakota College and Station. M. J. Buschlen has been appointed field superintendent in agronomy in the station. J. H. Christ, superintendent of the Sandpoint Substation, has resigned to become agronomist with the U. S. D. A. Soil Conservation Service, with headquarters at Colorado Springs, Colo., and has been succeeded by Ralph E. Knight.

Maryland University.—*School and Society* announces that Dr. Raymond A. Pearson, president from 1926 to 1935, has been appointed assistant to the Chief of the U. S. Resettlement Administration, and will aid in coordination of the work of that agency with the U. S. D. A. Extension Service.

Acting President H. C. Byrd has been appointed president.

Massachusetts College and Station.—A 2-year vocational training course is being offered in wildlife management, with an opening class of 16 and in charge of Dr. Reuben E. Trippensee.

Science announces that an initial fund of $5,000 has been given to the station by Mrs. Ella Lang for the purpose of expanding the research program now under way in the field of human nutrition as related especially to mineral metabolism.

F. W. Morse, recently retired as research professor of chemistry, has been appointed emeritus research professor. Other appointments include Dr. William G. Colby, assistant agronomist of the U. S. D. A. Soil Conservation Service, as research professor of agronomy, and Alfred A. Brown, regional representative of the American Fruit Growers and formerly extension specialist in marketing at the Vermont Station, as assistant research professor of agricultural economics.

Michigan College and Station.—The death is noted of Albert H. Nelson, professor of journalism and editor of station publications. He has been succeeded by A. A. Applegate, professor of rural journalism and editor at the South Dakota College and Station. Recent resignations include C. B. Dibble, research assistant in entomology; R. H. Westveld, research assistant in forestry; and C. W. Frutchey, as assistant in plant pathology. C. M. Harrison has been appointed research associate in farm crops; and Dr. L. L. Madsen and G. F. Gray, research assistants in agricultural chemistry and horticulture, respectively.

Mississippi College and Station.—H. W. Bennett and I. E. Miles have been appointed associates in agronomy, the former for research dealing primarily with the selection and breeding of forage and soil improving crops and the latter half time to the teaching of soils and one half to research on the relative symbiotic nitrogen fixation of legumes on various soil types. Other recent projects to be undertaken include a study of the possibilities in adapting selected forest trees to farm lands that have been retired from cultivation either through crop reduction programs or because of the submarginal character of the soil, and a study of the mineral content of leaf lettuce and spinach and the value of these vegetables in the regeneration of hemoglobin.

New York State Station.—Studies of the micro-organisms concerned with the ripening of cheeses of limburger, Oka, and brick types are being undertaken by the division of bacteriology, with assistance from the dairy division. Dr. C. D. Kelly, dairy bacteriologist, has been appointed to conduct the studies.

North Dakota College and Station.—Kenneth Ableiter, instructor in soils, has been appointed senior soil technologist in the U. S. D. A. Bureau of Chemistry and Soils to have charge of a new project for determining the best uses for land, and has been succeeded by Dr. Edward H. Tyner as professor of soils and research assistant in soils. Dr. E. A. Helgeson has been appointed assistant professor of botany, and will be in charge of teaching and research in plant physiology and of teaching in plant pathology. T. O. Berge has been appointed instructor and research assistant in bacteriology, succeeding Ina Brayton Bergquist. Felix L. Adams has been appointed assistant in agricultural economics, and will be employed upon a project in cooperative marketing.

Ohio Station.—Dr. Charles E. Thorne, director from 1887 to 1921, died February 29 at the advanced age of 89 years. An account of his career and services will appear in the May issue of the *Record*.

Puerto Rico Federal Station.—At the agricultural fair held in western Puerto Rico by the Federal Emergency Relief Administration, the station was awarded a handsome 24-in. silver cup "in recognition of the merit of its bamboo propagation and utilization project and its potential value to Puerto Rico."

Recent appointments include W. K. Bailey as associate physiologist in charge of truck crop investigations, Charles F. Pennington as assistant in vanilla production, J. H. Jensen as plant pathologist and physiologist, A. N. Watson as biometrician and physiologist, A. S. Mason (transferred from the U. S. D. A. Bureau of Agricultural Economics) as associate marketing specialist, C. L. Horn as associate horticulturist for plant introduction work, G. J. Burkhardt as associate agricultural engineer, and R. H. Moore as associate plant physiologist in connection with rotenone investigations.

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EXPERIMENT STATION RECORD

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DR. CHARLES EMBREE THORNE, 1846–1936

The death of Dr. Charles Embree Thorne, which took place at his home in Wooster, Ohio, on February 29, 1936, removed in his ninetieth year one of the few remaining pioneers in experiment station administration in this country. He was secretary of the first convention of the Association of American Agricultural Colleges and Experiment Stations, held in Washington, D. C., October 18–20, 1887, and for some years he and Dr. Charles W. Dabney had been the sole survivors of that historic gathering. Likewise, since the death of Dean W. A. Henry in 1932 he and Dr. Dabney had been the only living representatives of the directors who organized the experiment stations in their respective States following the passage of the Hatch Act. Dr. Thorne in particular, because of his active association with the work until 1921, had long been in a very real sense one of the main connecting links between the early days and the post-war era.

Needless to say, his claims for remembrance are much more comprehensive and substantial than mere length of days. Dean Davenport of Illinois said of him in 1913, "He has developed one of the strongest of all the experiment stations and one of the most helpful." Eight years later, Dr. E. W. Allen made the following statement in these columns: "Up to the time of the passage of the Hatch Act the Ohio Station had received about $5,000 a year. For the current year its appropriation is approximately $300,000, the largest of any of the stations. Its remarkable growth is a product of the constructive planning and leadership of its director, supported by a confident and appreciative Commonwealth."

The main outlines of Dr. Thorne's career are readily depicted. Born on a farm in Greene County in 1846, his entire life, aside from a short time as a student at the Michigan Agricultural College and a few months on a Kansas farm in 1870, was spent in Ohio. He completed his education at Antioch College, later receiving the honorary degrees of master of agriculture from the Ohio State University in 1890 and doctor of science from the College of Wooster in 1926. He did some teaching and farming in Ohio, and in 1877 became farm manager for the Ohio Agricultural and Mechanical University, now the Ohio State University. Failing in efforts to obtain the "practical laboratory for agricultural research" on the university farm which he had visualized, he resigned in 1881 to become editor of *Farm and Fireside*, but returned to the campus in 1888 as the first director of the station as reorganized following the passage of the Hatch Act. In the following year he took a leading part in the removal of the station from Columbus to Wooster, where under his leadership for the next 32 years an outstanding institution was developed. Retiring from active service as director in 1921, he continued as chief of the department of soils for several years and as consulting chief thereafter, utilizing the opportunity thereby afforded to digest and summarize his carefully planned and meticulously conducted field studies of soil fertility, and to supplement his manual on Farm Manures, published in 1913, by a more comprehensive treatise in 1928 entitled The Maintenance of Soil Fertility.

Although his energies were thus expended almost wholly within the boundaries of a single State, his influence was neither narrow nor provincial. He early became a leader in the Association of American Agricultural Colleges and Experiment Stations, where his thoroughness and dependability, his sound judgment, and his high ideals made him highly respected and esteemed. He was chosen president of this body in 1915, in the same year president of the Society for the Promotion of Agricultural Science, and in the year previous president of the American Society of Agronomy.

His presidential address before the Association of American Agricultural Colleges and Experiment Stations was especially noteworthy. Entitled The Progress of Education and Research in Agriculture, it recounted the growth of the experiment stations "from birth through infancy and adolescence to maturity." Commending the institutions for their attainments, he also warned them in his customary plain language that their vision of usefulness would "not be realized if research is allowed to languish. Science cannot stand still. Each extension of the horizon of our knowledge only expands the boundary of the unknown, and makes yet more imperative the necessity for further research, and the institution which contents itself with present knowledge will soon find itself forgotten."

This insistence upon thoroughgoing and fundamental investigation was characteristic and consistent. Despite limitations in education and environment which in lesser men might have proved serious handicaps, he was broad and progressive in his viewpoint, receptive to new light and surprisingly sympathetic to new methods of approach to unsolved problems. As Dr. Allen pointed out in an editorial in these columns on his retirement, "although he had not had opportunity for that broad and severe college training we now associate with the preparation of the investigator, Prof. Thorne has evidenced a true scientific mind, because his has been a truth-loving and a truth-seeking mind. To a large extent he may be said to be self-made in his knowledge and in his appreciation and understanding of science. Through all the years he has labored diligently for the unbiased truth that he might know it. He has been close to agricultural practice and anxious to give it material aid, but he has sought first of all the facts and their meaning that he might have wisdom in their interpretation into practice. . . . The standards he has held up for himself and his staff have shown how deeply he was imbued with the spirit of science."

A similar view was expressed in 1931 by the late Dr. A. S. Alexander of Wisconsin in his series of illuminating biographies in *Better Crops With Plant Food* entitled The Inquiring Mind and the Seeing Eye. Dr. Alexander said, "Throughout his career Director Thorne has been careful, thorough, conservative, and always assured of his facts, with a background of adequate experience, before publishing his conclusions and deductions. These fine attributes should characterize every research worker and dominate his every act. They have given the work of Director Thorne a high reputation for integrity and reliability among scientists and farmers."

Many other appreciative tributes have been given from time to time and others are sure to be forthcoming, for despite its austerity and lack of spectacular appeal the enduring worth of his life has been widely recognized. It is well that this is so, for the half century of station history has seldom brought to fruition a career personifying more concretely the stations' objectives and ideals.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical and technological research by the Bureau of Chemistry and Soils] (*U. S. Dept. Agr., Bur. Chem. and Soils Rpt., 1935, pp. 3, 4–25*).—Summaries are given of results noted in studies of enzymes; plant pigments; the chemical components of the cuticle waxes of fruits; yeast proteins; the microbiology of hides and skins; the clarification and composition of sugarcane juices; deterioration in harvested cane; manufacture of sugarcane and sorgo sirups; a new method of processing extracted honey; increasing the uniformity of beet sugar; utilization of cull sweetpotatoes for starch; the toxicity of fluorine compounds; the vacuum carbon dioxide oiling method for egg storage; wine making and pasteurizing; orange and grapefruit juice investigations; alcoholic citrus beverages; citrus-peel oils; chemical composition of the loquat; utilizing the passion fruit; use of ethylene for loosening the hulls of walnuts; light and rancidity; lecithin content of soybeans; special breads (including a new type raised by hydrogen peroxide in place of yeast); the staling of bakery products; the bark of the Pacific coast hemlock as a source of tannin; leather studies, including the red rot or acid rot; turpentine and rosin studies; industrial use of farm products and byproducts; treatment of cotton fabrics with weather-resistant fireproofing; effect of atmospheric sulfur acids on paper; studies of tung oil, bagilumbang (banucalag) oil, and soybean oil; the digestibility of proteins; and the amino acid and selenium content of wheat.

Catalytic and induced reactions in microchemistry, I. M. Kolthoff and R. S. Livingston (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 4, pp. 209–213, fig. 1*).—The general theory of catalysis and induction in homogeneous systems is discussed in a contribution from the University of Minnesota. Brief mention of induced and catalyzed precipitations is followed by a general discussion of analytical applications. Finally, the catalytic and inducing effects of silver and of mercury and some new tests are described.

A rapid method for making standard solutions of specified normality, O. Johnson (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 1, p. 76*).—The author of a note contributed from the Washington State College describes a procedure involving the addition of a calculated quantity of 2 N acid to a solution made deliberately somewhat weaker than that finally to be made, indicating that "this procedure will be found less laborious than the customary one of making the solution stronger than desired and then diluting with water."

Apparatus for control of pressure in distillation, G. W. Jacobs (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 1, pp. 70, 71, figs. 2*).—Of an apparatus developed at Rutgers University, the author states, in part, that "the solenoid valve has certain advantages: It is positive in action, permits smooth regulation of pressure (±0.015 mm), is universally adaptable to vacuum and pressure, is available for closed systems of inert gases, and works on lighting outlet power without relay. This particular valve [that described and illustrated in the present contribution], moreover, experiences very little wear [illegible] is practically free from corrosion."

Photoelectric photometers for use in colorimetry, C. Zinzadze (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 4, pp. 280, 281, fig. 1*).—The author of this contribution from the New Jersey Experiment Stations describes two newly developed instruments of the two-cell form, both of which have proved satisfactory for the determination of potassium, phosphorus, and arsenic in solutions.

In the first instrument two photoelectric cells are on opposite sides of the light source, and between light and photocell, on each side, are an adjustable diaphragm and also a solution cell. While the two solution cells contain the same known solution, the diaphragms are so adjusted that the current output from both photocells is the same, as shown by means of a galvanometer. The known solution in one solution cell is then replaced by the solution to be studied, and the diaphragm on the opposite side is closed until the galvanometer again stands at zero. The reading for the unknown solution is taken from that diaphragm scale, which shows the amount of closure required to balance the two beams after the unknown solution is introduced.

The second instrument is like the first, except that adjustments and readings are made by means of calibrated potentiometers instead of diaphragms. Its essentials are shown in a diagrammatic drawing.

Photronic photoelectric turbidimeter for determining hydrocyanic acid in solutions, E. T. Bartholomew and E. C. Raby (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 1, pp. 68, 69, figs. 2*).—In the apparatus here described in a contribution from the California Citrus Experiment Station, a beam of light from a 32-candlepower automobile lamp operated at 8 v from a transformer is passed through a collimating lens, divided into two beams by mirrors directing the two resultant beams at right angles to the original path into two prisms in which the two beams are reflected through two solution cells and into two photoelectric cells arranged to produce opposing potentials across a potentiometer. Both solution cells containing portions of the solution to be examined, the silver nitrate titrating solution is added to the solution in one of the cells until an unbalancing of the opposed potentials of the photoelectric cells (as indicated by a deflection of a galvanometer included in the potentiometer circuit), shows that turbidity has appeared in the solution undergoing titration.

"With the photronic turbidimeter determinations could be made which were accurate to within 0.00054 mg of hydrocyanic acid, but for the authors' purpose determinations to within 0.027 mg were considered sufficiently accurate."

A photronic colorimeter and its application to the determination of fluoride, L. V. Wilcox (*Indus. and Engin. Chem., Analyt. Ed., 6 (1934), No. 3, pp. 167–169, figs. 3*).—Of the apparatus described in this contribution from the U. S. D. A. Bureau of Plant Industry the author says, in part, that it uses as its light-measuring elements two photoelectric cells of the type that transforms light energy directly into electrical energy without the use of an external electromotive force, the cells being electrically opposed in the present assembly and the current developed by them balanced by means of a variable resistance. A sensitive galvanometer is used as the indicating (null point) instrument. The intensity of the light transmitted through a colored solution is measured in terms of the resistance that must be interposed to balance the photronic cells.

The apparatus was satisfactorily used for the determination of fluoride in natural waters by a modification of the acetylacetone method. In earlier tests the thiocyanate reagent and method were used, but it was found that the acetylacetone reagent is somewhat less susceptible to the effect of sulfate and chloride than the thiocyanate reagent.

For the fluoride determination green glass filters, having a low transmission in the red, increased the sensitivity appreciably.

Determination of fluorine in drinking water, H. V. Smith (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 1, pp. 23–25*).—The fluorine contents of 44 water samples were determined at the Arizona Experiment Station by a number of methods, including those of Willard and Winter (E. S. R., 69, p. 489), of Sanchis (E. S. R., 74, p. 298), etc.

Fluorine concentrations of about 1 p. p. m. or higher, as found by the methods named, were associated with the incidence of mottled enamel disease. Concentrations up to from 0.7 to 0.8 p. p. m. were found in waters which had not been shown to cause the tooth enamel trouble.

Determination of bromide in the presence of large excess of chloride, R. F. and E. R. Newton (*Indus. and Engin. Chem., Analyt. Ed., 6 (1934), No. 3, pp. 213–215, fig. 1*).—A method for the determination of bromides in the presence of large excess of chlorides has been developed at Purdue University. The bromine is liberated by chlorine water in moderate excess, collected in sodium sulfite solution, and titrated potentiometrically after air oxidation of the excess sulfite.

For 4 mg or more of bromine present as bromide the maximum error was found to be about 0.2 percent, and for a bromine content of from 0.5 to 1 mg about 0.5 percent. Moderate quantities of iodides did not interfere.

Colorimetric determination of small quantities of chlorides in waters, H. B. Riffenburg (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 1, p. 14*).—The author modifies the titration with silver nitrate solution in the presence of potassium chromate as the indicator to the extent of adding the indicator solution to each of two Nessler tubes of the water to be examined and adding the silver solution, drop by drop, with frequent comparison with the tube containing only the sample and indicator solution. He advises that the silver nitrate solution should not be stronger than the equivalent of 0.05 mg per cubic centimeter, but "should not be too weak."

Identification of halides in the presence of thiocyanates, G. B. and L. K. Heisig (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 4, pp. 249, 250*).—Adding first carbon tetrachloride and then a small quantity of solid potassium persulfate is the basis for the iodine test described in this contribution from the University of Minnesota. Making the solution alkaline with sodium carbonate, after extracting the iodine as thoroughly as possible, and evaporating the alkaline solution to dryness served to destroy the remaining iodide ions and the thiocyanate ions, permitting a test for bromides. This test was made by adding concentrated nitric acid to the cold, iodine-free solution, letting the mixture stand for about 1 min. for the color due to the oxidation of any remaining thiocyanate to disappear, and extracting the bromine in carbon tetrachloride. For the chloride test, bromine is to be removed by adding a slight excess of potassium permanganate and boiling 1 min. Sulfate is removed by means of barium nitrate, and silver nitrate solution is then added.

Determination of minute amounts of copper in milk, L. W. Conn, A. H. Johnson, H. A. Trebler, and V. Karpenko (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 1, pp. 15–23*).—The authors compared various colorimetric methods, finding that the sodium diethyldithiocarbamate method is the most suitable for the estimation of small amounts of copper, the metal being first separated either by hydrogen sulfide or by microelectrolysis. "It is essential to eliminate all sources of contamination. It appears particularly advantageous to substitute centrifugalization for filtration."

The proposed colorimetric method was tested, both with copper sulfate solution and with milk ash solution, by experiments in which the copper deposited by electrolysis both before and after separation with hydrogen sulfide was determined first by weighing on the microbalance and then colorimetrically. A number of samples of milk and milk products were analyzed by the hydrogen sulfide-carbamate method.

Determination of lead: A modification of the Fischer-Leopoldi method, O. B. WINTER, H. M. ROBINSON, F. W. LAMB, and E. J. MILLER (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 4, pp. 265–271, figs. 2; abs. in Michigan Sta. Quart. Bul., 18 (1935), No. 2, p. 123*).—A colorimetric method based on the use of dithizone (diphenylthiocarbazone) for the microdetermination of lead is described. The lead is extracted from solution by means of a chloroform solution of dithizone, the intensity of the resultant red color of the lead dithizone compound in chloroform solution is measured, and the corresponding quantity of lead is read from a curve constructed from measurements made on known amounts of lead.

"The method is applicable to the estimation of lead in spray residues and biological materials and is sensitive to approximately 0.001 mg in these materials. Slight modifications of the method permit determination of lead in the presence of the interfering elements, bismuth and stannous tin. The method has the advantage of being both extremely sensitive and relatively rapid. With spray residues as many as 36 determinations may be made in 1 day, and with biological materials approximately 20, depending upon the type of material and method of preparing samples for analysis."

Microdetermination of lead, M. RANDALL and M. N. SARQUIS (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 1, pp. 2, 3, fig. 1*).—In a study of the solubility of lead sulfate in aqueous solutions of acetic acid at the University of California it was necessary to determine accurately small amounts, from 2 to 15 mg. of lead. From 95 to 99 percent of the lead in solution was precipitated electrolytically as lead peroxide, and the remainder was determined colorimetrically in the form of lead sulfide.

"The colorimetric value of the lead left in solution after electrolysis was in error from 5 to 20 percent, but since this value was a small addition to the value determined electrolytically, the result was a considerable lowering of the total percentage error, which without the colorimetric correction was from 2 to 10 percent." When the new method was used, "the accuracy in the most unfavorable cases was about 1.5 percent, and in the majority of cases it lay well below 1 percent."

Determination of minute amounts of lead in biological materials, E. S. WILKINS, JR., C. E. WILLOUGHBY, E. O. KRAEMER, and F. L. SMITH, 2ND. (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 1, pp. 33–36*).—The method described was found sensitive to 0.001 mg. Dithizone (diphenylthiocarbazone) is employed first in the separation of the lead from other metals and secondly in the final estimation of the lead by means of a quantitative titrimetric extraction. "Bismuth is the only interfering element likely to be encountered. A series of 10- to 15-g samples of whole blood can be analyzed with an average time per sample of about 2 hr."

A modified persulfate-arsenite method for manganese, with special reference to steel analysis, E. B. SANDELL, I. M. KOLTHOFF, and J. J. LINGANE (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 4, pp. 256–258*).—An investigation reported from the University of Minnesota has yielded a method for the determination of manganese in which the permanganic acid formed by the oxidation of the sample with ammonium persulfate, in the presence of phosphoric acid with silver as catalyst, is titrated with a reducing solution containing equivalent amounts of sodium arsenite and sodium nitrite instead of with the customary sodium arsenite alone.

"With the mixed reducing solution, heptavalent manganese is reduced to the divalent condition, and the solution therefore becomes colorless at the end point instead of yellow or brown as when arsenite alone is used for the titration. Small amounts of chromium, vanadium, nickel, and molybdenum do not interfere. Silver must be precipitated as the chloride before the titration can be made."

Determination of small amounts of potassium by means of sodium cobaltinitrite, H. W. Lohse (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 4, pp. 272, 273*).—Data obtained at the University of Toronto and the Ontario Agricultural College show that in the quantitative determination of potassium by precipitation with sodium cobaltinitrite it is necessary to take into account the fact that the potassium content of the precipitate is a function of the method of precipitation and the potassium concentration in the solution being analyzed.

"There seems to be a need for a very thorough analytical investigation in order to develop a satisfactory standard method for estimating small amounts of potassium by precipitating the potassium as sodium-potassium cobaltinitrite."

Determination of selenium, H. C. Dudley and H. G. Byers (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 1, pp. 3, 4*).—In a further contribution (E. S. R., 74, p. 299) from the U. S. D. A. Bureau of Chemistry and Soils, the authors propose a procedure involving oxidation with nitric acid and hydrogen peroxide, followed by the determinative method previously described.

"The material in a suitable state of subdivision is placed in a beaker (400 to 600 cc capacity), covered with 150 to 200 cc of concentrated nitric acid (sp. gr. 1.42), and allowed to stand at room temperature for from 2 to 3 hr., during which period it is stirred vigorously at intervals. Fifty cc of hydrogen peroxide (30 percent by weight) are added, and the mixture is allowed to stand overnight. If frothing occurs on addition of the hydrogen peroxide, foaming over is prevented by vigorous stirring of the foam. The foaming is particularly intense with blood, liver, and spleen. After standing overnight, the mixture is warmed slowly on the steam bath until frothing ceases, after which 50 cc more of hydrogen peroxide are added, together with 20 cc of concentrated sulfuric acid. The mixture is then taken to essentially complete dryness on the steam bath or hot plate. The cooled black paste is treated with 100 cc of hydrobromic acid (45 percent HBr) to which has been added sufficient bromine to make it deep yellow in color. The material is then transferred to a distilling flask, and 50 to 75 cc of distillate are collected. Further procedure is as directed by Robinson et al."

Of liquid samples, from 100 to 1,000 cc are to be similarly oxidized, the quantity taken depending on the nature of the sample and the concentration of selenium likely to be present.

Determination of minute quantities of sulfide sulfur, C. E. Lachele (*Indus. and Engin. Chem., Analyt. Ed., 6 (1934), No. 3, pp. 200, 201, fig. 1*).—In the procedure here described, the hydrogen sulfide, upon evolution from an acid solution, is continuously carried through a lead acetate-impregnated paper diaphragm by a stream of an inert gas, such as nitrogen. "The nitrogen, by intimately diluting the sulfide gas, permits a uniform coating of lead sulfide and sweeps the reaction flask free from residual sulfide gas." A uniform deposition of the stain was further aided by means of a 1- to 2-in. (2.5- to 5-cm) bed of small glass beads or standard Ottawa sand. The impregnated paper disk was closely fitted between two ground-glass joints of thick-walled glass tubing which are held together by a band of Gooch rubber tubing so that all gas leaving the reaction flask was forced to pass through the paper.

Under the conditions prescribed sulfur dioxide did not interfere, and only the sulfide evolved by acid was determined. The diameter of the chamber tube employed was governed by the amount of sulfide present. For amounts of volatile sulfide sulfur between 0.008 and 0.08 mg a 32-mm tube was found to be satisfactory, and under these conditions an accuracy of ±0.002 mg of sulfur was found possible. The delicacy of the test was increased by using chamber tubes of smaller diameter, however.

Determination of the phosphorus fractions in blood serum, R. R. Roepke (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 1, p. 78*).—In an investigation carried out at the Kansas Experiment Station, ashing with calcium acetate and neutralizing with ammonium hydroxide before developing the color produced unsatisfactory results because of various difficulties. These were overcome by ashing with magnesium nitrate (in total phosphorus, total acid-soluble phosphorus, and lipoid phosphorus determinations), and completing the determination in each case in accordance with a technic given in working detail.

The transition of citrate-soluble phosphate into the citrate-insoluble form in mixtures with limestone and with dolomite, W. H. MacIntire and W. M. Shaw (*Jour. Amer. Soc. Agron., 26 (1934), No. 8, pp. 656–661, fig. 1*).—It is reported from the Tennessee Experiment Station that extended exposures of frequently wetted mixtures of dicalcium phosphate with excesses of limestone and of dolomite of 100-mesh fineness in a humidified atmosphere demonstrated that nearly one-third of the theoretical transition from diphosphate to triphosphate was induced by the high-calcic limestone admixtures within the first week, as against a 60 percent transition for the 1-yr. period; that the transitions induced by the dolomite additions were much less rapid and extensive than those found when limestone was used; and that "the 'citrate-insoluble' P_2O_5 results obtained by the A. O. A. C. extraction method, as indicative of triphosphate transitions, were less than one-half of the maximal registered by the limestone disintegrations, whereas only a small increase in citrate-insoluble was registered by the analysis of the dolomite mixtures."

Colorimetric methods for the determination of phosphorus in the presence of silica, arsenic, iron, and nitrates, C. Zinzadze (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 4, pp. 227–230*).—Two methods for the molybdimetric determination of phosphate are outlined in a contribution from the New Jersey Experiment Stations, together with improvements in the preparation of the reagents leading to greater stability of the color and the elimination of the influence of silicates, arsenates, nitrates, and ferric iron.

The molybdenum blue reagent method produced the most stable color but was slower than the reduction method using stannous chloride. Gum arabic is suggested as a protective colloid to retard the turbidification which follows the use of stannous chloride. Several other reducing agents for color development are noted.

Colorimetric methods for the determination of arsenic in phosphorus-free solutions, C. Zinzadze (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 4, p. 230*).—A further note from the New Jersey Experiment Stations, supplementing the paper above mentioned, points out the possibility of applying the phosphate methods given, insofar as they do not involve any risk of reducing arsenic compounds from the pentavalent to the trivalent condition, to the determination of arsenates. The author calls attention to the necessity for avoiding the use of sodium bisulfite, by reason of its ability to reduce pentavalent arsenic compounds, adding that for the reduction of the molybdenum complex to develop the blue color only stannous chloride, of the several reducing agents named in connection with the phosphate determination, can be used in the determination of arsenic by means of the ceruleomolybdate reaction as here given.

"Prepare the standard or unknown as in the molybdenum blue reagent method up to the addition of the molybdenum blue reagent; add instead 5 cc of molybdenum trioxide reagent; make up to 40 cc with distilled water and mix; prepare all standard and unknown solutions exactly in this manner; then add rapidly in turn to each flask 5 cc of stannous chloride solution while shaking; make up to 50 cc with distilled water and mix thoroughly. After 20 min. make comparisons. The determination should not stand longer than 6 hr."

Determination of free silica, H. L. Ross and F. W. Sehl (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 1, pp. 30–32, figs. 2*).—In the modified petrographic immersion method here described, powdered mineral or dust immersed successively in fennel-seed oil and mononitrobenzene is examined with an ordinary microscope equipped with a Whipple disk. The percentage of transparent particles in fennel-seed oil minus the percentage of transparent particles in mononitrobenzene equals the percentage of free silica. "Any slight error made in counting and weighting these particles is self-compensating, and good checks can be obtained."

Method for the preparation of green plant material for the extraction of juices, L. D. Doneen (*Plant Physiol., 9 (1934), No. 4, pp. 839–843*).—In an investigation carried out at the Washington Experiment Station, a method including a freezing of the wheat plants in a cold storage room and a method involving autoclaving them before the expression of the sap were compared in determinations of the freezing point, total solids, total sugars, and nitrate nitrogen of the expressed plant juice.

"The osmotic pressure, total solids, total sugar, and nitrate nitrogen of the autoclaved and frozen plant tissue agree closely. The small variation that occurred could be accounted for partly by the difference in sampling. The proposed [autoclave] treatment of plant tissue can therefore be satisfactorily used for some phases of plant juice study instead of the freezing method."

A rapid method for dialyzing large quantities of protein solution, G. C. H. Stone (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 1, p. 8, fig. 1*).—Pieces of 2-in. cellophane tubing are closed at one end by folding and clamping with a screw clamp, and are fitted at the upper end with rubber stoppers carrying inlet tubes reaching nearly to the closed end and short outlet tubes. Several of these bags are grouped in a crock capable of holding from 5 to 10 l of the protein solution and are connected in series to a supply of running water. A motor-driven stirrer is placed in the middle of the crock. "Breakage of the sacks, due to internal pressure such as may occur in the usual methods of dialysis where the medium to be dialyzed is placed within the sack, is eliminated, because in this case the water passes out of the bags into the solution.

"It was found that 10 l of a solution consisting of a protein dissolved in 10 percent ammonium sulfate could be freed from the salt, as far as possible by ordinary dialysis, in the above apparatus in 24 hr.—18 with tap water and 6 with distilled water."

A micro hot-plate for protein hydrolysis, A. R. Patton (*Indus. and Engin. Chem., Analyt. Ed., 6 (1934), No. 3, p. 201, figs. 2*).—A contribution from the University of Minnesota describes a battery of six units, of which the heating elements are flat spirals of 6 in. per unit of No. 30 Chromel wire, each made of a size suitable for the heating of a 6- by ¾-in. test tube. The six heating elements and an adjustable resistance are connected in series and supplied with current from a 110-v line. The test tubes are provided each with a reflux condenser consisting of a 3- by ⅝-in. test tube having its closed end blown to a bulb large enough to rest in the mouth of the larger tube.

The protein samples used were of 0.1 g each. "The method results in efficient condensation in an all-glass system, uniform heating, and foolproof simplicity. With it tryptophan was determined in 60 samples with a probable error of 0.05 percent."

Preparation of aqueous extracts of soluble nitrogen from plant tissues, O. W. Davidson, H. E. Clark, and J. W. Shive (*Plant Physiol., 9 (1934), No. 4, pp. 817–822*).—A critical comparison of two methods for the preparation of aqueous extracts of the soluble nitrogenous constituents from plant tissues has been made at the New Jersey Experiment Stations.

It was found that the preparation of extracts by a process of boiling for 20 min., followed by thorough washing through "longcloth", was as effective in the removal of soluble nitrogenous constituents as was extraction by the process of grinding in a mortar with sand, followed by thorough washing through the cloth; and the preparation of aqueous extracts by the boiling method was found easier and quicker than by the grinding method. It was further shown that "the loss of cyanogenetic nitrogen which takes place when peach extracts are prepared by the grinding method may be minimized by the use of the boiling method."

Determination of ammoniacal and urea nitrogen, J. Y. Yee and R. O. E. Davis (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 4, pp. 259–261, fig. 1*).—An investigation reported from the U. S. D. A. Bureau of Chemistry and Soils had the object of adapting the urease method for use with such samples as those, for example, of ammoniated peat extracts, which are always highly colored and contain urea, ammonium salts, and under certain conditions a little free ammonia.

"The present investigation led to the development of a method whereby ammonia is determined by distillation at 40° C. with an alcoholic solution of an alkali under reduced pressure together with aeration. The urease reaction and distillation are carried out at 40°, because this temperature is near the optimum point, as demonstrated by Van Slyke and Cullen [E. S. R., 33, p. 116], for the enzyme action. Free ammonia or ammonium salts present in the sample can be liberated at this temperature by alkali without any danger of decomposing the urea. The urea is determined in such samples by difference (total ammoniacal and urea nitrogen minus that for free ammonia or ammonium salts). Complete recovery of the ammonia can be accomplished by this method in 10 to 15 min."

Quantitative determination of coumarin in plant material, I. J. Duncan and R. B. Dustman (*Indus. and Engin. Chem., Analyt. Ed., 6 (1934), No. 3, pp. 210–213, fig. 1*).—It has been found at the West Virginia Experiment Station that the steam distillation method for removing coumarin from plant tissues has certain decided advantages over the ether extraction method. It gives excellent results with sweetclover and seems to apply successfully to other species also. For comparative purposes where a high degree of accuracy is unnecessary, the number of distillations may be reduced and the distillates titrated directly without further treatment. For more accurate results the number of distillations is increased, and the noncoumarin reducing substances are removed by precipitation with lead acetate.

Determination of the acids of plant tissue.—III, Determination of citric acid, G. W. Pucher, H. B. Vickery, and C. S. Leavenworth (*Indus. and Engin. Chem., Analyt. Ed., 6 (1934), No. 3, pp. 190–192*).—Extending a research of which earlier results have been noted (E. S. R., 74, p. 295), the authors of this contribution from the Connecticut [New Haven] Experiment Station here present a method in which "citric acid is oxidized to pentabromoacetone by potassium permanganate in the presence of potassium bromide. The oxidation product is extracted by petroleum ether, dehalogenated by sodium sulfide, and the bromide ion produced is titrated with silver nitrate. Quantities of citric acid of the order of 1 to 20 mg can be determined in this manner with an accuracy of ±5 per cent. Malic acid alone of the common organic acids interferes in any way with the determination, and the error introduced by the presence of this substance is ordinarily so small as to be negligible. Inasmuch as the conversion of citric acid to pentabromoacetone is not quantitative, although in constant proportion under the conditions described, it is necessary to employ a correction factor in the calculation of the results. This factor is approximately 1.12."

Analysis of mixtures of oxalic and citric acids by titration with ceric sulfate, J. A. Wilkinson, I. R. Sipherd, E. I. Fulmer, and L. M. Christensen (*Indus. and Engin. Chem., Analyt. Ed., 6 (1934), No. 3, pp. 161–163, figs. 2*).—A method for the analysis of mixtures of citric and oxalic acid by a differential titration, first as an acid and then by oxidation with ceric sulfate, has been developed at the Iowa State College. It was found that "the accuracy is about 1 percent of the total acid present. The two acids may be separated from mixtures of other organic acids obtained in fermentation processes by the insolubility of their lead salts. These salts are changed back to the free acids by treatment of the suspension of the lead salts with hydrogen sulfide, and after filtering the excess of hydrogen sulfide can be removed by passing nitrogen gas through the solution."

Thiocyanogen number, W. J. Wiley and A. H. Gill (*Indus. and Engin. Chem., Analyt. Ed., 6 (1934), No. 4, p. 298*).—An investigation into the inaccuracies of the thiocyanogen number determination, carried out at the Massachusetts Institute of Technology, has shown that, if the determination of the thiocyanogen number is to be made as accurately as is that of the iodine number, samples double the size of those currently used will be required. Wide discrepancies among the results obtained with samples of 0.2 g and 25 cc of the reagent disappeared when samples of 0.4 g were used with 50 cc of the reagent.

The thiocyanogen value as a means of measuring unsaturated fatty acids in butterfat, O. J. Hill and L. S. Palmer (*Jour. Dairy Sci., 18 (1935), No. 7, pp. 455, 456*).—To secure satisfactory results in the examination of butterfat samples, the authors of this note, contributed from the Minnesota Experiment Station, found it necessary to modify to some extent the current methods for the measurement of the thiocyanogen value. They call attention to the fact that the figure in question cannot accurately be used, as some authors have attempted to do, as a basis for the calculation of the linoleic acid content. "The differences between the iodine value and the thiocyanogen value were used in this study to express the amount of fatty acid less saturated than oleic acid."

The effect upon the butterfat thiocyanogen value of a basal ration of low fat content, fed with and without the addition of various oils, was investigated. The figures obtained ranged from 2.49 to 4.16 when the basal ration alone was fed. The range was from 4.37 to 5.79 when linseed oil was added to the basal ration. Neither corn oil nor cottonseed oil in the ration increased the thiocyanogen value of the butterfat. The addition of coconut oil to the basal ration decreased the figure.

"It appears that the thiocyanogen value may be useful in studying the effect of feeds on the composition of butterfat."

Precise determination of calcium, magnesium, and phosphorus in evaporated milk, C. H. WHITNAH and H. L. ANDERSON (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 1, pp. 46, 47*).—An investigation made at the Kansas Experiment Station led to the conclusion that if a sensitive balance of large capacity be used and the temperatures for ashing the milk and for igniting the precipitates be properly chosen and closely maintained, it is possible to determine the calcium, magnesium, and phosphorus content of evaporated milk with a variation of less than 2 p. p. m.

"Addition of one or more of these minerals in amounts up to about 10 p. p. m. frequently improves the quality of the product."

Determination of moisture in dried apples, F. D. MERRILL, C. C. BAYMILLER, and P. F. NICHOLS (*Fruit Prod. Jour. and Amer. Vinegar Indus., 14 (1935), No. 8, pp. 232–234, 237*).—Various methods for the determination of moisture were subjected to comparative study at the University of California, as were also certain manipulative details involved in the methods, the work having special reference to the examination of dried apple preparations.

"There was very close agreement between different vacuum ovens in the determination of moisture in dried apples. In the same oven, different determinations on the same sample of dried apples were all within 0.2 percent of the average of a large number of determinations when either the 6-hr. or the 12-hr. drying period was used. The mean probable error of a single determination was about 0.05 percent for the 12-hr. method, and for the 6-hr. method it was about 0.11 percent. The maximum deviation from the average was less than 0.4 percent, and the mean probable error of a single determination was about 0.18 percent when the 4-hr. water oven method was used. The 12-hr. vacuum oven method gave results higher than the 6-hr. period by about 0.35 percent. This is somewhat less than is reported for some other fruits. Varying the load in the oven had little effect upon the determination when the drying capacity of the oven was not exceeded. Varying the amount of sample in the cells used with the electric resistance machine affected the results, and the sample should be ground with a 'nut butter' cutter, in order to secure a uniform pack.

"In the case of moisture determinations on dried apples by the vacuum oven or water-jacketed oven there was little effect in varying the following factors within the limits indicated: (1) Position in oven (vacuum oven only); (2) style of dish; (3) fineness of grinding, using either a 16-tooth cutter or a 40-tooth nut butter cutter; (4) variations in temperature from 68° to 75° C. in vacuum ovens; (5) variations of from 0 to 5 bubbles per second in the rate of air flow in vacuum ovens; (6) variations in vacuum up to 7½ lb. of pressure; (7) size of sample, from 5 to 20 g; (8) amount of moisture in the sample. . . .

"Attempts were made to standardize the water-jacketed oven against the 6-hr. vacuum oven method. Approximately equivalent results were obtained with a drying time of 2 hr. and 50 min. in the water oven."

Report of the committee on definitions of technical terms, C. H. BAILEY (*Cereal Chem., 12 (1935), No. 4, pp. 431, 432*).—The committee report here noted specifies that the weight of flour samples stated in the definitions shall be understood to refer to the weight calculated on the basis of a definite moisture content, 13.5 percent; and the report proposes definitions of the terms, standard loaf; response; tolerance; and strength (three definitions by Q. Landis, C. B. Morison, and M. J. Blish and M. A. Gray, respectively).

An improved method for the estimation of flour diastatic value, M. J. BLISH and R. M. SANDSTEDT (*Cereal Chem., 10 (1933), No. 3, pp. 189–202*).—The authors of this contribution from the Nebraska Experiment Station have adapted the ferricyanide method of H. C. Hagedorn and B. N. Jensen[1] to the estimation of diastatic activity (maltose values) of flour and related cereal products, describing a procedure which must be followed accurately to secure satisfactory results, and for the details of which reference should be made to the original article.

The method is shown to be a superior one from the standpoint of accuracy, reliability, simplicity, and convenience to the technician.

A comparative study of the Blish and Sandstedt and a modified Rumsey procedure for the estimation of diastatic activity, W. F. Geddes and W. J. Eva (*Cereal Chem.*, *12* (*1935*), *No. 4*, *pp. 402–410*, *fig. 1*).—The authors report, from the Dominion Grain Research Laboratory, Canada, a comparative study of a modified Rumsey method (E. S. R., 48, p. 504) and the improved method of Blish and Sandstedt above noted, 89 wheat flours varying in diastatic activity from approximately 70 to 300 units having been used in the trials. The modifications in the Rumsey method consisted in conducting the diastasis at 30° C. and the use of a sodium acetate-acetic acid buffer solution (pH 4.61) to control acidity. The reducing sugars were determined by the Quisumbing and Thomas copper reduction procedure (E. S. R., 46, p. 113) by direct weighing of cuprous oxide and also by a volumetric thiosulfate method on the same precipitates.

"A statistical analysis of the data showed that while the spread in the diastatic activities of the flours was lower for the improved method, this is more than counteracted by the much lower experimental error, with the result that this procedure gives a much better differentiation between the diastatic activity of different flours than either the gravimetric or volumetric copper reduction procedures. A difference of 7.5 units between the means of duplicate determinations on two flours was statistically significant for the ferricyanide procedure, while differences of 14.8 and 15.8 units would be required in the instance of the gravimetric and volumetric copper reduction procedures respectively.

"For the entire series the Blish and Sandstedt method gives a significantly lower mean diastatic activity by 4.7 and 4 units, respectively, than the gravimetric and volumetric copper procedures, due to the method giving appreciably lower values in the instance of flours of high diastatic activity. However, the correlations between the results by all methods were of a very high order of magnitude, and diastatic activity by the Rumsey method (gravimetric determination of reduced copper) may be estimated from the Blish and Sandstedt values with a standard error, for a single predicted value, of ±12.7 units. The Blish and Sandstedt improved method is to be preferred to the modified Rumsey method employing either the gravimetric or volumetric procedures for the determination of reduced copper from the standpoints of greater convenience, lower experimental error, and better differentiation between flours."

Determination of viscosity of dilute solutions of cassava flour and other starches, G. G. Pierson (*Indus. and Engin. Chem.*, *Analyt. Ed.*, *6* (*1934*), *No. 3*, *pp. 183–187*, *figs. 4*).—After a consideration of certain viscosity characteristics of some of the commonly known and widely used cassava flours and other starches, various methods of testing are discussed, and a new method and apparatus for preparing and testing dilute hot solutions are described.

Relation of hydrogen ion concentration and total acidity to the taste of tomatoes, R. B. Harvey and R. R. Fulton (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, *14* (*1935*), *No. 8*, *pp. 238*, *239*, *fig. 1*).—In an investigation reported from the U. S. D. A. Bureau of Plant Industry on 26 varieties of ripe tomatoes, grown and collected under the same conditions in closely adjoining plats, the H-ion concentration varied from pH 4.147 to 4.565 and the total acidity from 0.318 to 0.61 percent malic acid.

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[1] Biochem. Ztschr., 135 (1923), No. 1–3, pp. 46–58, fig. 1.

"In estimating the sourness to taste of the varieties it was found that the globe-shaped red tomatoes ought generally to seem less sour to taste, and the yellow varieties somewhat more sour than the average for red tomatoes, disregarding variations in the sugar content."

The chemical composition of the loquat (Eriobotrya japonica), C. G. Church and D. G. Sorber (*Fruit Prod. Jour. and Amer. Vinegar Indus., 14 (1935), No. 11, pp. 335–340, figs. 3*).—The chemical composition of three well-known varieties of loquats grown in southern California, Champagne, Advance, and Thales, has been investigated for two seasons by the U. S. D. A. Bureau of Chemistry and Soils. The results are presented in tabular form, together with a discussion. Analyses of this fruit by other investigators are tabulated, together with similar data for apples, and are compared with the results obtained by the authors.

How to avoid the browning of peaches, W. V. Cruess, E. M. Mrak, and P. J. Quin (*Canning Age, 16 (1935), No. 9, pp. 353, 354, figs. 2*).—A brief contribution from the University of California describes browning as an oxidation process brought about by an oxidase, which hastens the combination of atmospheric oxygen with a "color base", possibly a catechol tannin, present in the fruit. "This oxidation is greatly hastened by lowering the H-ion concentration, that is, the active acidity. Lye peeling reduces the H-ion concentration in the cups and on the remaining surface of the fruit; hence, increases the rate of darkening. Peaches vary greatly in susceptibility to browning. Immature fruit and that from trees suffering from lack of water darken very rapidly."

A temperature of 180° F. was found sufficient to destroy the oxidase, but this temperature could not be attained throughout the whole mass of large peach halves without a time period and external temperature too great to be allowable (by reason of its effect in making the fruit too tender for further handling) in commercial practice. Rinsing for from ½ to 2 min. in 0.5 percent hydrochloric acid after lye peeling effectually prevented the darkening by lowering the pH value (superficially raised by lye peeling to a point at which the browning was very rapid) to such a degree as to lessen greatly the activity of the enzyme. As an example of the effect of organic acids: "Rinsing ½ to 2 min. in 0.5 to 1 percent citric acid arrested browning for 30 min. in most cases, but after 1 to 3 hours' exposure considerable browning usually occurred."

Prune moisture content and processing, P. F. Nichols (*Fruit Prod. Jour. and Amer. Vinegar Indus., 14 (1935), Nos. 7, pp. 211–213, 215; 8, pp. 240, 241, 253; 11, pp. 332–334, 342; 12, pp. 370–372, 381, figs. 3*).—The work here reported from the University of California has brought together a large volume of analytical data for fruit of several crop years and grown under various local conditions. The significance of these data in relation to commercial processing is discussed, as are also the relative merits of certain of the analytical methods used.

Filtering fruit juices and plant extracts, J. A. Hall and W. E. Baier (*Indus. and Engin. Chem., Analyt. Ed., 6 (1934), No. 3, p. 208, fig. 1*).—Layers of paper pulp alternated with thin layers of a commercial filter aid (diatomaceous earth) are built up on a circle of filter cloth in a Büchner funnel.

"There are two objects of the alternate layers of paper pulp and filter aid. Extremely fine particles are easily retained by the filter, so that brilliantly clear filtrates result. By using and removing successively the paper-pulp filter mats, a large quantity of liquid may be filtered with the minimum of dilution or loss in starting the filtering operation."

Chemical changes accompanying the fermentation of cherry juice, C. A. Swisher and C. F. Poe (*Fruit Prod. Jour. and Amer. Vinegar Indus., 14 (1935), No. 12, pp. 367–369, 379, figs. 5*).—This investigation was made with the purpose of ascertaining "the change in the composition of the juice during the process of fermentation, so that the samples received at the laboratory after some fermentation had taken place could be calculated back to their original composition."

It was found that "in all of the samples kept at 25° C. the fermentation took place very quickly. There was a very rapid reduction in the total solids and reducing sugars after the third day. In about 2 weeks, nearly all of the sugars had been used up. The alcohol reached a maximum in about 7 days. As was to be expected, the fermentation of the sample kept in the refrigerator was very much slower than in the sample kept at 25°. There was little change in the fixed acids and volatile acids during the fermentation process."

Wine makers warned against spoilage of Muscat, W. V. Cruess (*Fruit Prod. Jour. and Amer. Vinegar Indus., 14 (1935), No. 11, p. 327, fig. 1*).—A brief note contributed from the University of California calls attention to the danger of extensive spoilage of must during fermentation by an organism found in a number of must samples and also on leaves and in the soil of vineyards. The organism was shown to be a wild yeast, apparently of the genus *Torula*. It is controllable by from 50 to 100 p. p. m. of sulfur dioxide. Maintaining a temperature below 90° F. is also advised.

The tourne disease of wine, W. V. Cruess (*Fruit. Prod. Jour. and Amer. Vinegar Indus., 14 (1935), No. 7, pp. 198–200, 219*).—This brief discussion from the University of California of a wine disease found to be among the most serious causes of spoilage in California wine making is similar to the following contribution in containing a condensed description of the symptoms produced, of the micro-organism believed to be mainly responsible, and of the methods found most effectve in combating the development of spoilage of this type.

Control of tourne, W. V. Cruess (*Fruit Prod. Jour. and Amer. Vinegar Indus., 14 (1935), No. 12, pp. 359, 360*).—The author finds the "tourne" disease of wines (development of a greatly increased volatile acid content, a "silky" cloudiness, and a flavor suggestive of lactic acid) to be due, in part at least, to an anaërobic, long rod bacterial form, and, probably, in part to other organisms.

Maintaining a sulfur dioxide content of from 50 to 75 p. p. m. was found an effective means for preventing tourne. To kill the organism by pasteurization the temperature had to be raised from 180° to 185° F. and maintained for 1 min. It is noted that the continuous pasteurization temperatures of from 140° to 160°, recommended in some books on wine making, are "most decidedly" not sufficient to kill the tourne organisms as they appear in the California wineries. It was further found that it is possible to sterilize wines infected by the tourne organisms by means of a quite practicable filtration procedure.

The use of honey in making fermented drinks, F. W. Fabian (*Fruit Prod. Jour. and Amer. Vinegar Indus., 14 (1935), No. 12, pp. 363–366, 377; abs. in Michigan Sta. Quart. Bul., 18 (1935), No. 2, p. 122*).—Experiments carried out at the Michigan Experiment Station have shown that honey can be used to advantage as a supplementary sweetening agent in producing a fermented drink from fruit juices. The best results were secured by adding the honey gradually rather than all at one time, and it was also found that the honey should always be dissolved in the fruit juice and thoroughly mixed. The mixture required to be pasteurized, or sterilized in some cases, and a starter of pure wine yeast added. Of the fruit juices studied, honey improved the flavor of fermented cider the most and of grape juice the least, with cherry juice occupying the intermediate position.

"Fermented cider having a Balling reading of 15° at the end of the fermentation makes the most pleasing drink. Fermented cider having a higher Balling reading is too sweet, while one with a lower Balling reading has more of the characteristics of 'hard' cider. It was found when the total acidity calculated as acetic is multiplied by 100 that the ratio of acidity: Balling: alcohol in the best flavored drink is 4:1:1. The final Balling reading on fermented cherry juice may be as low as 10° but should not be greater than 15° for the best flavor. Honey diluted to 30° Balling with the addition of certain necessary chemicals and fermented with a pure culture of wine yeasts makes a very pleasant bland alcoholic drink.

"There is a considerable variation in different strains of the true wine yeast as to the amount of alcohol produced, their ability to agglutinate, and the flavor of the finished product."

Effect of pretreatments of wood on the lignin determination: Distribution of methoxyls in wood, G. J. RITTER and J. H. BARBOUR (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 4, pp. 238–240*).—Data obtained at the Wisconsin Forest Products Laboratory show that the accuracy of the determination of lignin in wood by means of the 72 percent sulfuric acid method is affected by the quantity and the nature of the extraneous materials incompletely removed from the wood by preliminary treatments.

Successive extractions of wood with 95 percent alcohol, alcohol-benzene solution, and hot water made the 72 percent sulfuric acid method for the lignin determination more adaptable to North American woods. It was further found that if the kind and amount of extraneous materials present in a given species of wood be known, the preliminary treatments can be modified accordingly. "For example, if catechol tannins are absent the extraction with 95 percent alcohol may be eliminated." The methoxyl groups of redwood and white oak woods were found to be distributed among the extraneous materials, the holocellulose, and the lignin.

Utilization of agricultural wastes, I, II (*Indus. and Engin. Chem., 27 (1935), Nos. 2, pp. 195–200, figs. 5; 4, pp. 416–419, fig. 1*).—A cooperative investigation by the U. S. D. A. Bureau of Chemistry and Soils and the Iowa Engineering Experiment Station is reported.

I. *Lignin and microbial decomposition*, M. Levine, G. H. Nelson, D. Q. Anderson, and P. B. Jacobs.—It was found that "alkali lignin, when added to an actively digesting sludge, produced practically no gas, even under optimum conditions. Furthermore, when such alkali lignin was used in conjunction with fermenting cornstalk flour or packing-house sludge, the gasification of the latter materials was markedly inhibited. This depressive effect is apparently not due to a toxic action of the lignin on the bacterial flora, but is presumably due to chemical combination, with the possible production of complexes very resistant to microbial decomposition.

"A considerable portion of the reported losses in lignin, attributed to microbial decomposition, may be explained by the technic of selection and preparation of the sample for lignin analysis."

II. *Influence of nitrogenous substrate on production of butyl and isopropyl alcohols by Clostridium butylicum,* O. L. Osburn and C. H. Werkman.—The authors record the results of experiments on the production of butyl and isopropyl alcohols by the fermentation of byproduct glucose sirup with *C. butylicum* in the presence of various proteins.

"The growth-stimulating factor described by Tatum, Peterson, and Fred [E. S. R., 69, p. 771] may be considered beneficial but not essential to the fermentation of glucose. The yield of butyl alcohol from corn mash increases from about 3 to 14 percent when the stimulating factor is added. The proteolytic power of the organism is weak. With hydrolyzed proteins the rates of the fermentations are slower than when peptone is present, but the percentage yields of alcohols compare favorably with the yields obtained with peptone. With mixtures of corn steep water and malt sprouts or corn gluten as sources of nitrogen, glucose may be fermented in 4 percent solution with the production of 20 to 25 percent of butyl alcohol and from 4 to 9 percent of isopropyl alcohol."

The cooking process.—VIII, Volatile organic acids by the saponification of aspen wood, S. I. Aronovsky and R. A. Gortner (*Indus. and Engin. Chem., 27 (1935), No. 4, pp. 451–454, figs. 3*).—A contribution from the Minnesota Experiment Station, continuing the record of a series of investigations (E. S. R., 73, p. 743), reports that after the treatment of aspen sawdust with sodium carbonate solutions at 170° C. for 2 hr. the volatile organic acids were recovered from the black liquors by distillation with phosphoric acid and were neutralized with barium hydroxide. The yields, calculated as acetic acid, varied from 4.6 to 7 percent of the oven-dry wood. A decrease in the concentration of sodium carbonate gave a slight decrease in the yields of volatile acids, while varying the wood-to-water ratio, within the limits stated, had no appreciable effect.

"The production of volatile organic acids from wood in these experiments is therefore attributed to saponification. The coefficient of distribution of these acids between water and ether showed that only acetic and formic acids were present. The ratio of formic to acetic acid varied from 1:5.9 to 1:9.4."

AGRICULTRAL METEOROLOGY

Some problems of modern meteorology (*London: Roy. Met. Soc., 1934, pp. V+170, figs. 16; rev. in Bul. Amer. Met. Soc., 16 (1935), No. 11, pp. 272–276*).—This is a series of papers by various authors reprinted from the *Quarterly Journal of the Royal Meteorological Society.* Among those having some bearing on agricultural meteorology are The Present Position of Weather Forecasting, by C. K. M. Douglas (pp. 27–35) (E. S. R., 66, p. 116); The Present Position of Seasonal Weather Forecasting, by C. W. B. Normand (pp. 43–50);[2] and The Problem of Rainfall, by C. K. M. Douglas (pp. 126–135).[3]

With regard to forecasting, it is stated, in an introduction by D. Brunt, that "it is probable that no improvement in forecasting is to be looked for beyond the slight improvements which will follow from the increase in the amount of information available and increased rapidity of transmission." It is stated that "the one outstanding new idea of the last 20 years is that associated in the minds of most meteorologists with the 'polar front.' The greatest achievement of this idea is the establishment of the fact that a cyclonic depression has a life cycle, not only in its lower levels, but also in the cirrus levels." The difficulty of securing a complete and adequate knowledge of upper air conditions is referred to.

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[2] Quart. Jour. Roy. Met. Soc. [London], 58 (1932), No. 243, pp. 3–10.

[3] Quart. Jour. Roy. Met. Soc. [London], 60 (1934), No. 254, pp. 143–152, figs. 4.

Monthly Weather Review, [September–October 1935] (*U. S. Mo. Weather Rev., 63 (1935), Nos. 9, pp. 269–289, pls. 11; 10, pp. 291–311, pls. 11, fig. 1*).—In addition to the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and bibliographical and other information, these numbers contain the following contributions.

No. 9.—The Hurricane of August 31 to September 6, 1935 (pp. 269–271), and West Indian Hurricane, September 23 to October 2, 1935 (pp. 271, 272), both by W. F. McDonald.

No. 10.—Rate of Precipitation from Adiabatically Ascending Air, by J. R. Fulks (pp. 291-294); and The Caribbean Hurricane of October 19–26, 1935 (pp. 294, 295), and Lowest Barometer Reading in the Florida Keys Storm of September 2, 1935 (p. 295), both by W. F. McDonald.

Forty years of weather records, F. E. Hepner (*Wyoming Sta. Bul. 209 (1935), pp. 48, pls. 2*).—Results of continued observations on air pressure, temperature, and frosts, rainfall and humidity, sunshine, and wind, at Laramie, Wyo., are summarized in this bulletin, supplementing and bringing up to date a previous bulletin published in 1924 (E. S. R., 52, p. 716). The results are presented in tabular and graphic form and briefly discussed, giving a rather complete picture of climatic conditions in the region of Laramie and the factors affecting and controlling them.

Weather forecasting (*U. S. Dept. Agr., Sec. Agr. Rpt., 1935, pp. 87, 88*).—Asserting that "long-range weather forecasting is a basic problem which should be more studied", this article briefly considers the possibility of reliably attempting such forecasting, the practical value of the forecasts, and some of the directions in which basic information for this purpose is being sought, such, for example, as the relations of weather in widely separated parts of the earth. "Such relationships are undoubtedly associated with the general circulation of the atmosphere and the behavior of the so-called 'centers of action.' Thorough investigation of such associations as they affect the weather in the United States would be profitable. Foreknowledge of the weather, such as would make it possible, for example, to predict droughts, would obviously be of enormous practical value, not merely in revealing factors which control variations in crop yields, but in the regulation of all kinds of economic activities."

[The 35-year drought cycle], E. R. Miller (*Sci. News Letter, 28 (1935), No. 743, p. 14*).—By reference to the 35-year Brückner weather cycle, evidence is adduced to indicate a sudden and sharp return to moister and more comfortable summers in the United States.

Influence of the stratosphere on development of weather [trans. title], H. von Ficker (*Naturwissenschaften, 23 (1935), No. 32, pp. 551–555; abs. in Sci. Abs., Sect. A—Phys., 38 (1935), No. 454, p. 1001*).—The author concludes from his study of the subject that for forecasting weather changes it is important to establish changes in both the troposphere and stratosphere. He suggests that the difficulty in obtaining stratospheric observations may be overcome by using radio sounding balloon ascents for pressure, temperature, and humidity, but that international cooperation is required to get a simultaneous record from about 12 points in Europe, north Africa, and the western Atlantic.

Bacteriology of the atmosphere (*Nature [London], 136 (1935), No. 3448, pp. 880, 881*).—The history and significance of study of the bacteriology of the air are briefly discussed, particularly from the standpoint of air-borne infections. It is stated that "the biological side of meteorology remains an unexhausted field for investigation. It has been too rashly assumed that the atmosphere cannot offer a permanent home to micro-organisms, and that those which are found there are strayed wanderers from their true homes and are either dead or in some dormant, spore form. Investigation makes this much less certain. The number and variety of organisms found are sometimes very great, and they are in many cases not referable to types found elsewhere. . . . Airplane surveys have made it clear that micro-organisms occur in sporadic clouds, like those of ocean plankton, which may be found at any height that has so far been investigated, that is, up to 20,000 ft."

The growers' year (*Bul. Amer. Met. Soc., 16 (1935), No. 11, pp. 257–260, pl. 1*).—This is a brief note on a paper by Sir Napier Shaw entitled Further Development of the Growers' Year: A Daylight Calendar, and discussion of it by C. F. Brooks. It deals with the proposal of a phenological year, which it is stated "is meeting with a certain degree of acceptance in England. The quarters are centered on the solstices and equinoxes, and subdivided into chapters, one of five weeks centered on solstice or equinox and two of four weeks each, on either side. 'For agricultural purposes daylight is so much more important than moonlight that a daylight calendar with the week as an intermediate time-unit between the day and the year is worth . . . consideration.'" Some objection to the proposal as applied to American conditions are pointed out. For example, attention is called to the fact that "when one attempts . . . to squeeze the crop year into the phenological calendar [proposed] it is found that an important part of the growing season is omitted in the fall."

Spring frosts and protection against them [trans. title], C. Maurain and H. Geslin (*Compt. Rend. Acad. Agr. France, 21 (1935), No. 30, pp. 1137–1142*).—This article deals briefly with conditions under which frosts occur and do most damage, their prediction, the means and materials for protection against them, particularly the use of heaters, and the relative resistance of plants to cold.

Corn yield and climate in the Corn Belt, J. K. Rose (*Geogr. Rev., 26 (1936), No. 1, pp. 88–102, figs. 12*).—The correlation of variations in corn yield with fluctuations of climatic factors, particularly temperature and precipitation, the author finds to be a very complex problem. Reviewing the work of others with special reference to the influence of May-October rainfall and temperature on corn yield, he reaches the conclusion that "variation in July rainfall is not everywhere so important a factor in corn yield as earlier investigators believed. . . . Rather, it seems that corn yield in some parts is to be significantly correlated with several—even ten or more—factors covering much or all of the period of growth and reproduction. In other parts significant correlations with corn yield are found for few or none of the climatic factors investigated. It does seem that of the factors studied variations in temperature are more significant and more critical to corn yield than are variations in precipitation. Also, the midseason period of growth and reproduction is, on the whole, more critical than the early season, except only in the northeastern part."

Climatic changes following forest planting in the Nebraska sandhills, J. Roeser, Jr. (*Jour. Colo.-Wyo. Acad. Sci., 2 (1935), No. 1, p. 42*).—Comparison of weather observations at two stations, one in the open and the other in a mixed plantation of Scotch and jack pine about 30 ft. in height, showed a marked decrease in wind movement and evaporation, an appreciably lower soil temperature, and a reduction of mean air temperature (not, however, reducing the mean growing-season temperature) as a result of the forest planting. The mean daily temperature range was higher under the tree cover.

The amount of precipitation reaching the ground under the tree was 17 percent less than in the open.

Climatic effects of the proposed wooded shelter belt in the Great Plains, S. S. Visher (*Ann. Assoc. Amer. Geogr., 25 (1935), No. 2, pp. 63–73, fig. 1; abs. in Bul. Amer. Met. Soc., 16 (1935), No. 11, p. 279*).—From his study of this subject the author concludes "that the shelterbelt would not produce the improvement of climate claimed for it by the advocates, and that climatically it is not justified", although it may be expected to have some local effect in arresting drifting snow and dust, lowering spring and summer temperatures, and reducing wind velocity.

SOILS—FERTILIZERS

Bibliography of soil science, fertilizers, and general agronomy, 1931–1934 (*Harpenden, Eng.: Imp. Bur. Soil Sci., 1935, pp. XXXI+473*).—This bibliography has been compiled from the references included in the first 41 lists of "publications relating to soils and fertilizers" issued by the Imperial Bureau of Soil Science and covers the period 1931–34. It is noted that, "as each list represents only 1 month's output of literature, its value is necessarily transitory, and the object of the bibliography is to offer a more permanent record of the most recent section of the bureau's index. In that index every entry is minutely classified and cross-referenced, but in the bibliography, although the same decimal system is used, the classification has been considerably simplified both for the sake of conciseness and of users who are necessarily unconversant with the intricacies of bibliographical classification."

The book contains an explanatory preface which presents a brief account of the classification system used, an index of the classification numbers, a main bibliography, a geographical bibliography, a subject index, a list of abbreviations, and an author index.

[Soil and fertilizer investigations] (*U. S. Dept. Agr., Bur. Chem. and Soils Rpt., 1935, pp. 2, 3, 29–43*).—Data are reported from studies of the factors which influence the activities of catalysts in converting atmospheric nitrogen into fertilizer materials, nitrogen fixation by *Azotobacter*, and other findings relating to basic research on fertilizers; trace elements in soils; selenium investigations; physical constants of gases and fertilizer salts; the ammoniation of peat; potash and phosphate studies; and mixed fertilizer technology.

[Soil fertility investigations and researches in soil microbiology], O. Schreiner and C. Thom (*U. S. Dept. Agr., Bur. Plant Indus. Rpt., 1935, pp. 20–22*).—The soil fertility work of the Bureau of Plant Industry has included investigations of the effects of acid-forming fertilizers and of the effect of fertilizers on cotton root rot, experiments on the improvement of light soils, calcined phosphate tests, and a study of magnesium deficiency.

Subjects of microbiological research included a new slime mold, *Dictyostelium discoideum*, cellulose-decomposing molds, legume inoculants, nitrogen fixation by *Azotobacter*, and effects of *Pseudomonas fluorescens* and other soil micro-organisms on selenium.

[Soil and fertilizer work of the Maryland Station] (*Maryland Sta. Rpt. 1934, pp. XV–XVII*).—This has included an investigation of the effect of overflow salt water on soils, experiments on the effect of organic matter on the fertility of Leonardtown loam, and field studies of the fertility requirements and management of important soil types in three counties.

A classification of soil structure and its relation to the main soil groups, L. D. Baver (*Amer. Soil Survey Assoc. Bul. 16 (1934), pp. 107–109, figs. 3*).—In the classification scheme discussed by the author of this contribution from the

University of Missouri, "the microstructure of soils has been divided into three main groups or classes. These groups are differentiated by the nature of the arrangement of the soil particles. . . . The structural arrangement of a soil may consist of (1) chiefly secondary particles, (2) chiefly primary particles, and (3) a mixture of secondary and primary particles in which there is a single-grained arrangement within the secondary units. . . . In considering the relation of these types of structure to each other, it seems that the degradation of a granular type of structure leads first to the formation of prismlike or platelike units and subsequently to the single-grained state. On the other hand, the formation of secondary units in a soil in which single-grained structure predominates usually takes place with the formation of platelike units.

"These types of structure can be correlated fairly well with the typical soils within each of the main soil groups. True granulation, where the structural arrangement consists of secondary particles, is best expressed in the chernozemlike soils, particularly the surface horizon. This type of structure tends to change with increasing depth toward fragmentation, inasmuch as columnar and prismatic structure forms become manifest. The laterites and dark humid prairie soils (surface) occupy an intermediate position between granulation and fragmentation. The structure of the brown, red, and yellow forest soils consists chiefly of an arrangement due to a mixture of secondary and primary particles. This is especially true of the B horizons. Variations, of course, occur within this group. The gray forest soils, or podsols, are characterized by single-grained structure. Desert soils contain some secondary units, but they usually fall within the class of platelike particles."

A method of land classification from soil survey maps in North Dakota, K. V. Goodman (*Amer. Soil Survey Assoc. Bul. 15 (1934), pp. 94–97, figs. 3*).—This brief discussion deals "primarily with the method of expressing in percentages the valuations of 40-acre tracts from soil survey maps." A system of classification, together with the set of literal and numerical symbols necessary for its use, is outlined.

A method for making mechanical analysis of the ultimate natural structure of soils, G. J. Bouyoucos (*Soil Sci., 40 (1935), No. 6, pp. 481–485*).—The author of this contribution from the Michigan Experiment Station notes that "when lumps of air-dry soils are placed in an excess of water, they slake or disintegrate into particles or granules of various sizes. These slaked particles or granules are considered to represent the ultimate natural structure of soils, because they appear to be stable and they require the application of external energy and dispersing agents to break them up further. An attempt was made to work out a method for making mechanical analysis of this ultimate natural structure of soils. A combination of the sieve method and the hydrometer method [E. S. R., 57, p. 710] was finally adopted for this purpose.

"The results obtained show that the ultimate natural structure varies considerably with the different soils but is distinct for each soil. As a general rule, the ultimate natural structure of most soils seems to be coarse, ranging in size from about 2 to 0.15 mm. Many soils have more than 90 percent of their particles or aggregates in this range."

A sedimentation tube for analyzing water-stable soil aggregates, R. C. Cole and N. E. Edlefsen (*Soil Sci., 40 (1935), No. 6, pp. 473–479, figs. 2*).—An apparatus designed at the University of California to measure the size distribution of particles when slaked in water, without appreciably breaking up the particles, consists of a brass tube 30 in. long, inside of which is another brass tube of the same length machined to fit snugly. The inside tube is cut into sections 2 in. long, with ends machined, so that there is a close fit at the joints of the various segments. Caps are fitted to screw on both ends of the outside tube so that the segments are held tightly in place. The bottom cap is flat and has several holes, closed with screws which may be removed for drainage. The top cap is hollowed out slightly, and is fitted with a pet cock so that the tube can be completely filled with water. There are a number of holes in this cap (closed with screws) which may be opened for drainage.

"The bottom cap, with all holes closed, is screwed on the outer tube. The inner tube is put in place and nearly filled with distilled water. Sufficient soil is then added to make 54 g of oven-dry soil (2 percent suspension) and allowed to slake for at least 2 hr. The tube is filled level full of water, the temperature recorded, the top cap screwed on, and the hollow portion of the cap filled with water through the pet cock in the top. The tube thus assembled and filled is mounted on a wheel, which is free to turn, and is rotated in a manner which . . . produces a fairly uniform distribution of the particles in suspension.

"After mixing is complete, the tube is brought to a vertical position, the settling is allowed to take place parallel to the axis of the tube for a designated time, and then the tube is quickly turned to a horizontal position and allowed to stand 10 to 12 hr. so that the particles will settle perpendicular to its axis on the walls of the segments. The water is then drained off by removing the screws from the upper portion of the tube first and allowing the water to run out drop by drop. After draining, which requires from 10 to 12 hr., the tube is dismounted, the inner tube is taken out, the material collected on each segment carefully washed into beakers, the water evaporated, and the residue weighed. Each 2-in. segment is considered as a unit, and the average settling velocity for each is obtained by dividing the time into the distance from the top of the column to the center of each segment."

The significance of size distribution in the clay fraction, J. G. Steele and R. Bradfield (*Amer. Soil Survey Assoc. Bul. 15 (1934), pp. 88–93, figs. 2*).—The physical composition of profiles of Ellsworth silt loam and Miami silt loam is reported in an investigation carried out at the Ohio State University. Two methods of dispersion were used, namely, (1) treatment with sodium oxalate and (2) removal of bases by electrodialysis and saturation with sodium, added as the hydroxide. Each sample was stirred 15 min. with a high speed stirring machine. By means of the pipette method the 5μ clay was separated into seven fractions on the basis of settling velocities. Four fractions were determined by gravity sedimentation, and three by means of the centrifuge.

The amount of the total clay was consistently higher, and the proportion of the finest fraction was lower, in the case of dispersion with sodium oxalate. In both profiles the surface horizons contained very little material of a radius less than 125 mμ. In both subsoils, this fraction made up from 40 to 50 percent of the total clay. The Miami subsoil contained 60 percent of 5μ clay, one-third of which had a radius smaller than 31 mμ. The Ellsworth subsoil contained 43 percent total clay, (5μ), of which only one-fourth belongs to the finest fraction. Calculations of total surface showed that the ratio $\frac{\text{total surface per gram of soil}}{\text{percent of } 5\mu \text{ clay}}$ was 20 percent greater for the Miami B horizon than for the corresponding horizon of the Ellsworth soil.

It is suggested that all of the physical properties of soils "can be better interpreted with more complete knowledge of size distribution."

Variations in soil texture as revealed by moisture equivalent determinations, H. A. Lunt (*Jour. Amer. Soc. Agron., 26 (1934), No. 8, pp. 713–715*).—In a study of moisture relationships under trees, the author of this contribution from the Connecticut [New Haven] Experiment Station found that a Merrimac coarse sand, to all appearances quite uniform, could be shown to have a very significant variation in the moisture equivalent of samples of the same depth taken at 2- or 3-ft. intervals.

"Irregularities in the deposition of this soil material are the primary cause of the variations in texture as revealed by the moisture equivalent determinations. For the most part these irregularities are not discernible in the field and can be detected only when some physical test, such as the moisture equivalent, is made. Where the object of a study is to compare the moisture equivalent of different soils, the relatively small differences herein reported are not of great importance. Their real significance lies in studies involving differences in soil moisture within any one soil or closely identical types.

"The writer suggests, therefore, that in moisture studies of this nature, particularly in glacial and glacial outwash soils, the moisture equivalent determination be made on at least every other sample and preferably every sample, even though the borings are in close proximity to each other. Certainly no comparisons of the moisture content of soils in different locations is permissible without first relating such values to the moisture equivalent, wilting coefficient, or some other soil property value."

Influence of parent material on soil character in a humid, temperate climate, R. S. Stauffer (*Jour. Amer. Soc. Agron., 27 (1935), No. 11, pp. 885–894, figs. 2*).—The author of this contribution from the Illinois Experiment Station made a detailed comparative study of Clarence, Elliott, and Saybrook silt loams, which, although developed from calcareous, glacial drift of about the same age and subjected to very similar climatic and topographic conditions, differ widely in their properties.

"The data presented here show that where other factors concerned in soil formation, such as age of material, rainfall, temperature, topography, and vegetative cover, are very similar, soils may still vary widely in their properties due to differences in materials from which they are being formed. Further, the glacial drift varies greatly even within short distances, and these differences are reflected in the soils formed from it. This study emphasizes the importance of a knowledge of the parent materials of soils in any system of soil mapping. Such knowledge is a valuable aid in securing consistent mapping over large areas. It further emphasizes the necessity of examining the soil profile to considerable depths, at least through the B horizon, if one is not to be misled by temporary conditions. Parent materials will be responsible to some extent for the characteristics of all except the most highly weathered soils. Young soils may owe their characteristics more to their parent materials than to the weathering forces."

The composition and constitution of the colloids of certain of the great groups of soils, H. G. Byers, L. T. Alexander, and R. S. Holmes (*U. S. Dept. Agr., Tech. Bul. 484 (1935), pp. 39*).—In an investigation reported from the Bureau of Chemistry and Soils, the authors obtained detailed analytical figures for eight soil profiles representing six of the great groups of soils. These data include mechanical and chemical analyses of the soils and chemical analyses of the colloids. Values derived from the analytical results are also tabulated.

"The results show that the colloids of the great groups of soils differ from each other, and that there exists a chemical basis for the characteristics manifested in the field. The Chernozems are characterised by high silica-sesquioxide and silica-alumina ratios and by uniformity of colloid composition throughout the profile. The Prairie colloids have distinctly lower silica ratios than the Chernozems but are essentially free from carbonates. The colloid profile is constant in composition. The Gray-Brown Podsolic colloids are not sharply different in silica ratios from the Prairie colloids but show more variation in profile. The lateritic and Laterite groups have low silica-alumina ratios but very high silica-base ratios. The Podzol soils reflect in colloid composition the extensive fractionation which has taken place within the profiles."

The analytical data have been correlated to develop a systematic relationship between the soil colloids independently of any assumptions with regard to the causes of these relationships. The results have been discussed from the standpoint of the genetic relationships of the inorganic colloids and the light they throw on hypothetical considerations of colloidal acid composition.

Taxonomic considerations in soil correlation, T. M. Bushnell (*Amer. Soil Survey Assoc. Bul. 15 (1934), pp. 110–114, fig. 1*).—The author of this contribution from Purdue University points out that "the 'key to soil series in Indiana' is the tangible product of efforts to systematize our data. While many details of this key are of interest only to those who work with the same soil series, there are certain byproducts which may be of more general interest." The key is shown, in the form of a chart, the scheme of classification upon which it is based is briefly indicated, and a number of shortcomings of the present methods of soil taxonomy, as compared with those which have been worked out for botanical taxonomy, are suggested.

Soils of Orleans County, New York, in their relation to orchard planting, A. T. Sweet (*[New York] Cornell Sta. Bul. 637 (1935), pp. 32, pls. 2, figs. 5*).—The author points out that "because of the expense of planting and maintaining an orchard, and because of its normally long life, it is especially important that the site be well chosen. The character of a soil for orchard planting can be fully determined only by a careful field examination. Good orchard soils are characterized by nearly uniform color of soil and subsoil, medium texture, friable structure, and good depth. Gradations in color, texture, or structure indicate more favorable conditions than do abrupt changes. Poor orchard soils are indicated by a dark surface, by layers of light gray strongly mottled with yellow and rusty brown in the subsoil, or by clay, compact sand, or rock beds at a shallow depth. Soils with high ground water should not be considered for orchard planting, but medium or poor soils may be improved by providing good drainage."

Soil maps of the eastern and western parts of the county accompany the bulletin, and the various soil series are discussed.

The relation of soil erosion to certain inherent soil properties, J. F. Lutz (*Soil Sci., 40 (1935), No. 6, pp. 439–457, figs. 8*).—This paper reports upon an investigation leading to the conclusions (1) that the erosiveness of the Iredell is due to its ease of dispersion and to the dense, impervious nature of the B horizon, and that hydration is an important factor in its dispersion; and (2) that the nonerosive nature of the Davidson clay is due to the nonhydrated condition and the high degree of flocculation of the colloidal fraction into large porous and stable aggregates.

It was found that the Davidson colloids flocculated irrespective of the kind of exchangeable cations on the complex, whereas only the H-, Ca-, and Ba- Iredell systems flocculated. Electrokinetic potentials of the Iredell, Davidson, and Putnam soils were practically the same, indicating that hydration, rather than charge, was the main contributing factor to stability of the suspensions. Swelling was in the order Bentonite>Putnam>Iredell>Davidson. This is the reverse of the SiO_2-R_2O_3 ratios. The K, Na, and Li cations showed no definite order of effect on the swelling of the colloids. The Ca, Ba, and H decreased swelling in the order named. Permeability of the different clay membranes was in the order H>Ba>Ca>K>Na>Li.

"These physicochemical properties of the colloids are paramount factors influencing the erosiveness of soils."

Do soils wear out? A. W. Blair (*Amer. Fert., 83 (1935), No. 12, pp. 11, 26, 28, figs. 2*).—The author of this contribution from the New Jersey Experiment Stations answers the above question in the negative in a brief popular discussion. He notes the injury which may result from erosion, from depletion by improper farming methods, from excess either of acidity or of alkalinity, from "a notable deficiency of some one element in certain cases", from accumulation of the toxic substances present in sprays and in certain fertilizers or from other improper treatment, etc., but shows that none of these causes can do the soil irremediable harm.

Soil fertility in relation to productive land value, W. L. Powers (*Oregon Sta. Circ. 113 (1935), pp. 9, figs. 3*).—During 21 yr. the experiment of relying on rainfall for moisture and reseeding the navy bean crop year after year on the same soil on the station farm has been shown to be unprofitable. With rotation of crops the yields per acre increased, and a further increase was noted when rotation was aided by applications of barnyard manure. Irrigation under the continuous-cropping method was not much more profitable than continuous cropping without irrigation. "The substantial gains throughout the period of the experiment were made with rotated crops under irrigation, and especially with rotated crops under irrigation with added applications of manure. Not only did the yield increase under the latter method, but the water requirement of the soil was almost 50 percent less than for continuous cropping without irrigation.

"The experiment showed that it is far more profitable to keep the soil productive than to restore fertility, as rebuilding exhausted land is a long-time and costly process."

The salt content of some soils near the salt plain in Alfalfa County, Oklahoma, in relation to crop production, H. F. Murphy (*Jour. Amer. Soc. Agron., 26 (1934), No. 8, pp. 644–650*).—Among the saline soils at the Oklahoma Experiment Station, "while most of the barren areas were much higher, some few of them were near 1 percent in total soluble salt content. . . . The lowest amount of total soluble salts found in the surface soil where no vegetation was growing was 0.914 percent," in an alfalfa field. In another case, 0.894 percent of soluble salts was present in a soil where growth was very scant. Corn was a failure on soil containing a little over 1 percent and made only an inferior forage growth at 0.866 percent with moisture conditions favorable. Kafir was a failure on soil analyzing slightly over 1 percent of soluble salts. "These data indicate that even with favorable soil moisture a total soluble salt content of 0.8 to 1 percent would prevent the growth of ordinary field crop plants.

"The data on the amount of calcium and sodium soluble in and replaceable by neutral normal ammonium acetate show a great difference in the Ca-Na ratios for the barren soils and the productive soils. All of the nonproductive soils contain a large amount of active sodium, while the amount present in the productive soils is very much smaller. The active calcium content, while it varies somewhat, is not so greatly different for the two groups of soils; hence it is the large amount of sodium that accounts for the narrower Ca-Na ratios in the barren soils. The widest Ca-Na ratio (1.953) in the barren soil group was for a soil on which young wheat had died during a rather severe dry spell. Data as to crop conditions were secured on the other barren soils when the moisture conditions were generally favorable to crop production, hence these narrow ratios indicate in general nonproductive soils."

A comparison of several legumes with respect to nitrogen accretion, T. L. Lyon and J. A. Bizzell (*Jour. Amer. Soc. Agron., 26 (1934), No. 8, pp. 651–656*).—The purpose of the experiment described in this contribution from the [New York] Cornell Experiment Station was to grow for a period of years several kinds of legumes and to measure the total quantity of nitrogen contained in the legumes and in the cereal crops alternated with them, as well as the gain or loss of soil nitrogen. Various legumes, alone and in combination with other crops, were grown for 10 yr. on a soil with an initial nitrogen content of 0.0842 percent. Nitrogen was determined in the soil at the beginning and at the end of the experiment, and in all the crops grown during the period.

"Alfalfa and the cereals alternated with it contained more nitrogen than did any other combination of legumes and cereals. Red clover and alsike clover were approximately equal in nitrogen contained in the crops, but the mixture of the two clovers was superior to either one separately. Of the legume grain crops, soybeans was the most effective. The rotation without legumes contained the smallest quantity of nitrogen.

"The gains in soil nitrogen in some cases were large. Generally the larger gains in soil nitrogen were associated with large amounts of nitrogen in crops. Of the legumes, those grown for hay were the most effective in increasing soil nitrogen. Field beans caused the greatest reduction of soil nitrogen of any crop grown. The greatest apparent fixation of nitrogen was shown by alfalfa followed by sweetclover and a mixture of red and alsike clovers. The mixture of red and alsike clovers was superior to either grown alone. All rotations which included legumes showed significant apparent fixation. Nonsymbiotic fixation amounted to 17 lb. of nitrogen to the acre annually. Comparison of the data obtained with those secured on a soil with a higher initial nitrogen content showed that the gains of soil nitrogen were greater and the losses less in the low-nitrogen soil. These differences are accounted for by the larger quantities of nitrogen removed by the crops from the high-nitrogen soil."

The role of plant constituents in the preservation of nitrogen in the soil, S. A. Waksman and I. J. Hutchings (*Soil Sci., 40 (1935), No 6, pp. 487–497*).—A study of the influence of straw and of two of the most important groups of its constituents, cellulose and lignin, in preventing the loss of nitrogen added to a sand medium in the form of an ammonium salt and a protein has been made at the New Jersey Experiment Stations.

"The results obtained are sufficient to emphasize the fact that the preservation of the nitrogen in the soil depends on a number of factors, chief among which are the nature of the nitrogen source and the nature of the organic matter added to the soil. The loss of nitrogen from a sand medium was largely prevented, under the particular experimental conditions, by the use of certain forms of organic matter; this resulted in the preservation of the nitrogen in the soil in the form of humus. . . . The function of celulose and of other carbohydrates consists in supplying energy for the activities of the micro-organisms, with the result that the nitrogen is transformed into microbial cell substance; the function of lignin consists in its action as a buffer for the absorption of the ammonia and in the fixation of the protein."

The importance of soil organic matter, R. M. Barnette (*Citrus Indus., 16 (1935), No. 6, p. 18*).—This is a brief popular discussion from the Florida Experiment Station.

Decomposition of organic matter in Norfolk sand: The effect upon soil and drainage water, C. E. Bell (*Jour. Amer. Soc. Agron. 27 (1935), No. 11, pp. 934–946, figs. 6*).—In a study of the influence of various organic materials, inorganic fertilizers, and environmental conditions on the pH of the soil, on the quantity of exchangeable bases present, and on the residual nitrogen and organic matter in Norfolk sand at the Iowa Experiment Station, the addition of freshly ground, dried organic matter reduced the pH at the beginning of the experiment below that of the virgin soil. The application of ammonium sulfate further reduced the pH, and the soils treated with complete fertilizer were reduced in pH to a greater extent than in the case of the ammonium sulfate treated soils. There was a gradual increase of the pH throughout the experiment.

The addition of the various organic materials caused a slight increase in the residual nitrogen in the soils after 1 yr. The addition of inorganic nitrogenous fertilizer with these organic materials in cropped soils caused a slight loss of nitrogen as compared with that observed when only organic matter had been applied. In those cropped soils to which inorganic nitrogenous fertilizers were added alone there was an increase in the nitrogen over that found in the untreated check.

The application of organic matter caused an increased residual organic matter content at the end of the experiment, but apparently had little effect upon the amount of drainage water lost from Norfolk sand over a period of 1 yr. More drainage water and total nitrogen were lost from the fallow than from the cropped soils, and the quantity of nitrogen lost depended upon the amount added to the soil.

The addition of organic matter increased the exchangeable calcium and magnesium content both in the fallow and in the cropped soils. All the soils to which ammonium sulfate was added contained less exchangeable calcium than the soils not treated with this material. Additions of complete fertilizer to the fallow soils increased the exchangeable calcium. Apparently, the presence of nitrogen reduced the quantity of exchangeable calcium in the soil. The fallow soils contained more exchangeable sodium and potassium than did the cropped soils.

More total bases were lost through drainage from the fallow soils. The loss of total bases was increased by the addition of organic matter, and applications of inorganic fertilizers increased their loss. The loss of bases was greatest from the soils to which the greater quantity of nitrogen was added.

The addition of organic matter failed to show any favorable influence on the retentive power of Norfolk sand as determined in this investigation. The soils to which ammonium sulfate had been added showed the greatest loss of calcium, but the presence of organic matter tended to reduce this loss. The addition of organic matter seemed to cause a greater loss of sodium and potassium.

The calcium ion occurred in quantities greater than those of the sodium or potassium ions in the soil as well as in the drainage water. It is noted, however, that "this condition might have been due to a greater amount of the element calcium being present at the beginning of the experiment." The monovalent ions were found in greater quantity in the drainage water from the fallow soils than in the water from the cropped soils, but the quantity of the calcium ion was about the same in the two cases. A greater quantity of the magnesium ion was found in exchangeable form in the cropped soils, except where complete fertilizer was added. In the case of drainage waters this was reversed. As the proportion of calcium in the total bases in the drainage waters increased, the proportion of potassium decreased.

The influence of controlled temperature and soil treatment on some soil bacteria, C. S. Bryan (*Michigan Sta. Quart. Bul., 18 (1935), No. 2, pp. 106–113*).—An increase in the number of colonies developing on Brown's albumin agar plates was obtained after a storage of the soil at 25°, 7°, and −20° C. The increase in the case of the first two temperatures appeared to be due to multiplication of the bacteria, whereas the increase at −20° seemed to have been the result of a breaking up of clumps of bacteria, which permitted the development of more colonies on the plates, rather than the result of actual multiplication or transportation of bacteria from below during freezing. The temperatures of storage apparently did not cause a shift in the types of bacteria as judged by their biological activities.

"Temperatures of 25°, 7°, and −20° for from 1 to 10 weeks do not affect the ammonifying and denitrifying bacteria present in a fertile soil. The soil treatments of the soil studied likewise did not influence the activity of these bacteria. These temperature conditions of storage did affect the nitrifying bacteria as indicated by the varying periods of time necessary for nitrification to take place. Nitrification was delayed when the soils were subjected to low temperatures for long periods of time."

The urea-decomposing microflora of soils.—I, Description and classification of the organisms, T. Gibson (*Zentbl. Bakt.* [*etc.*], *2. Abt., 92 (1935), No. 13–19, pp. 364–380, pls. 2*).—This contribution from the Edinburgh and East of Scotland College of Agriculture consists mainly of a description and classification of soil bacteria which bring about the active decomposition of urea, other than those which may be classified in the *Bacillus pasteuri* group or as *Sarcina ureа*. The following are described: (1) A series of strains exhibiting affinities to the *B. pasteuri* group, (2) *B. lentus* n. sp., (3) *B. fusiformis*, (4) *B. repens* n. sp., and (5) *B. carotarum*. Descriptions of the variants produced by laboratory cultures of the three latter species are also given.

Experiments with the Winogradsky spontaneous culture test on humid soils, A. W. Young (*Jour. Tenn. Acad. Sci., 9 (1934), No. 4, pp. 292–294; 10 (1935), No. 1, pp. 64–70*).—Experiments on Iowa Carrington loam samples indicated, according to a report from the University of Tennessee, that the Carrington soils used contain "some factor or group of factors . . . preventing a satisfactory use of the spontaneous culture method for determining their plant food deficiencies. This factor is not sufficiently active, however, to prevent the normal development of the typical *Azotobacter* growth of the arid soils of Colorado and Utah when the Iowa soil is mixed in a 3 to 1 proportion with either of them. It seems hardly possible that the soils used in this experiment lack the organisms which develop on the spontaneous culture plates, for with proper treatments in the tests the typical growth appears on the majority of the spontaneous culture plates made from the soils of the different plats. Of course, it is possible that some soils with a lower pH than these tested would not support the soil flora on which the test depends. . . .

"In the light of the experiments set forth in this paper it seems that the Winogradsky spontaneous culture test as heretofore employed is not entirely suited for the accurate determination of plant food deficiencies in Iowa soils. However, the author feels that it may be possible to modify the method so that the plant food deficiencies of these soils may be determined with reasonable accuracy."

Availability and fixation of phosphorus in Hawaiian soils, A. F. Heck (*Jour. Amer. Soc. Agron., 27 (1935), No. 11, pp. 874–884, fig. 1*).—This contribution from the Wisconsin Experiment Station indicates that the availability of the native phosphates in Hawaiian lateritic soils is more variable than in most soils from the continental United States, as many as three-fourths of these Laterites having a phosphate availability so low that they should respond to phosphate treatment. "Laterites with a pH value below 6.5 are usually low in available phosphorus. Forty-six percent of the soils reported showed less than 25 p. p. m of available phosphorus. Native phosphorus in these Laterites of low phosphorus availability is largely in the form of basic iron phosphate with a solubility of phosphorus similar to that of dufrenite.

"When soluble phosphorus is applied to these Laterites, the majority of them fix over 80 percent of the applied phosphorus in slowly available form. Most of the applied phosphorus is fixed in the soil as the basic iron phosphates, with perhaps some aluminum phosphates. Seldom is much of the applied phosphorus held in these Laterites in the form of calcium phosphate."

Suitable fertilizer mixtures for different crops, including the functions of chief plant nutrients, H. B. MANN and W. H. RANKIN (*North Carolina Sta. Agron. Inform. Circ. 97 (1935), pp. [1]+12*).—The authors list fertilizer mixtures deemed suitable for cotton, corn, small grains, grasses, tobacco, Irish potatoes, adapted vegetables, melons, legumes, sweetpotatoes, and strawberries when grown on soils of average fertility in the three main soil provinces of the State.

Fertilizers for different crops, including the best percentages of water-insoluble nitrogen of totals in fertilizer mixtures (*North Carolina Sta. Agron. Inform. Circ. 96 (1935), pp. [1]+13*).—Fertilizer mixtures considered suitable for meeting local soil and crop conditions are given for various soil groups and for each crop grown under specified soil conditions, as well as "the recommendations of the department of agronomy with reference to the most suitable water-insoluble nitrogen content of fertilizer mixtures for different crops grown on different classes of soils in average condition of the three main soil provinces of the State."

Soil, field-crop, pasture, and vegetable-crop management for Erie County, New York, I, IV (*[New York] Cornell Sta. Bul. 630 (1935), pp. 5–55, figs. 13; 115–120, pl. 1*).—Of the four parts of this bulletin, the first and last only are here noted. For parts 2 and 3 see pages 627 and 636.

I. *Soils and field crops*, A. F. Gustafson.—This section of the bulletin takes up the climate, the topography and drainage, and the agriculture of Erie County; discusses the soils of the county under the heads of 12 soil areas; and considers the crop adaptations of 42 series individually. The lime needs of Erie County soils are taken up, together with the production and use of manure, the use of fertilizer on feed crops in Erie County, and rotations and their fertilization. Cropping and tillage suggestions are presented, and the uses of rough and unproductive soils are indicated.

IV. *Soil map and soil-type descriptions*, C. S. Pearson, F. B. Howe, and A. F. Gustafson.—This section of the bulletin contains a soil map and soil-type descriptions.

The fertilizer requirement of Hagerstown soil, F. D. GARDNER (*Jour. Amer. Soc. Agron., 26 (1934), No. 8, pp. 661–665*).—An investigation carried out at the Pennsylvania Experiment Station has shown that in such a 4-yr. grain rotation as that followed in the experiment here recorded, liberal dressings of available phosphorus and potassium on limed land are sufficient to maintain the productivity of Hagerstown soil. Nitrogen supplied by the clover crop residues, together with that fixed by nonsymbiotic micro-organisms, was sufficient to meet the needs of the grain crop included in the rotation. The nitrogen supply of the soil was not permanently increased by applying inorganic nitrogen, but it was shown to be influenced by increasing crop yields and by the return of more crop residues to the soil. "Even this may be overcome by the accelerating effect of such nitrogen on the decomposition of crop residues."

Effects of particle size on the properties and efficiency of fertilizers, A. L. MEHRING, L. M. WHITE, W. H. ROSS, and J. E. ADAMS (*U. S. Dept. Agr., Tech. Bul. 485* (*1935*), *pp. 27, figs. 2*).—The authors report from the Bureau of Chemistry and Soils a study of the effects of particle size on the properties and behavior of fertilizers during preparation and use. In the field tests nonsegregating fertilizers with grains ranging in fineness from that of a 2- to 3-mesh grade to that of an 80- to 150-mesh grade, and dry-mixed fertilizers with the superphosphate particles only varying in size, were applied accurately and uniformly to cotton in three soil types for three seasons. Of the grained fertilizers from 80- to 150-mesh particles produced the highest yields in a majority of the 13 trials. The smallest superphosphate particles were the most effective in every test, and the average difference in yield as between the smallest and largest particles was more than enough to pay for all of the fertilizer used. Chemical analyses of the soil to which the fertilizers had been applied were made to determine the differences in the rate of leaching and changes in solubility of the fertilizer elements, and laboratory tests were made to determine the present range of particle size in typical fertilizers and the effects of particle size on various properties of fertilizers and their behavior during handling and distribution. The most efficient particle size under average circumstances was found to be that of an 80- to 150-mesh grade, the criteria used for determining relative efficiencies having been stand counts and yields of seed cotton.

Proceedings of the tenth annual meeting of the Joint Committee on Fertilizer Application (*Joint Com. Fert. Appl. Proc., 10* (*1934*), *pp.* [2]+*118, fig. 1*).—This report of the proceedings of a joint committee representing the American Society of Agricultural Engineers, the American Society of Agronomy, the American Society for Horticultural Science, the Farm Equipment Institute, and The National Fertilizer Association indicates the scope of the machine fertilizer application investigations and includes summaries of potato experiments in Maine, New York, New Jersey, Michigan, Ohio, and Virginia; corn experiments in Ohio, Indiana, and Missouri; vegetable crop experiments in New York, Michigan, Virginia, and Florida; cotton experiments with acid and neutral fertilizers at five points among the Southern States; sugar beet experiments in Michigan, Colorado, and Nebraska; and tobacco experiments in the Southeastern States, together with brief discussions of the significance of minor plant foods, by L. G. Willis, and of progress in developing machinery for side placement of fertilizer, by F. H. Bateman.

Studies on phosphate rock as a filler substitute in fertilizer mixtures, R. L. SMITH (*Com. Fert., 51* (*1935*), *No. 5, pp. 14, 16, 18, 20, 22–24*).—According to a communication from the South Carolina Experiment Station, "the data secured in these tests comparing phosphate rock and dolomitic limestone as filler substitutes do not show significant differences either in crop yields, soil reaction, or composition of plant material. By reason of the slowness of reaction of these materials in the soil and the small quantities of them that are added annually in practice, it would be necessary to continue such a study for a relatively long period of time to accurately determine the comparative effects of these materials on soil reaction and crop response.

"The results secured from the various applications of moisture, temperature, and pressure, approximating conditions occurring in a fertilizer curing pile, showed no great increase in available phosphoric acid. However, a 4–8–4 fertilizer mixture which was held for 7 days at a temperature of 80° C.

showed from 1 percent to 2.45 percent gains in available phosphoric acid. This would indicate that even more available phosphoric acid might be produced from conditions not represented in this test." Other conclusions are also stated.

Studies on calcium cyanamide, IV, V (*Jour. Agr. Sci.* [*England*], *24* (*1934*), *No. 4, pp. 491–510; 25* (*1935*), *No. 1, pp. 132–150, figs. 3*).—These two papers continue a series already noted (E. S. R., 68, p. 454).

IV. *The use of calcium cyanamide and other forms of nitrogen on grassland*, H. L. Richardson.—Reporting upon experiments extending the earlier investigations, the author states that after the first 2 weeks there was little difference in the soil inorganic nitrogen added as calcium cyanamide and that derived from ammonium sulfate. A moderate dressing of dicyanodiamide slightly reduced but did not inhibit nitrification, and it did not appreciably retard the disappearance of inorganic nitrogen from the soil in the winter. Winter applications of ammonium sulfate produced less increase in either yield or nitrogen content of repeatedly mown herbage than did those added in the spring, and a late autumn application was almost as effective as a spring treatment. Calcium cyanamide in the late autumn or early winter was on the whole less effective than ammonium sulfate, but in the spring the two were substantially equal. There was little evidence that calcium cyanamide was "slow acting" in comparison with ammonium sulfate. Dicyanodiamide was practically inert so far as the effect of winter dressings on yield or nitrogen uptake was concerned. Under repeated mowing the response of the herbage to a 2-cwt. dressing of ammonium sulfate (or other nitrogenous fertilizer) was rapidly exhausted. Later in the year there was a reduction in yield with spring ammonium sulfate, resulting from a depression of clovers in the summer through competition with the heavier growth of grass in the spring.

The recovery of added nitrogen in the herbage was, at best, less than 40 percent. It is suggested that this may have been due in part to its locking up by microbiological action in the soil organic matter.

V. *The utilisation of calcium cyanamide in pot culture experiments*, H. L. Richardson and E. M. Crowther.—In pot culture experiments with barley and mustard in several soils over a number of years, the yield differences between calcium cyanamide and ammonium sulfate were generally small. Calcium cyanamide gave slightly the poorer results in soils with high responses to added nitrogen, but definitely better ones in soils which contained much available nitrogen and in which calcium cyanamide greatly retarded nitrification. The pot culture experiments confirmed the conclusion from earlier laboratory work that in normal soils calcium cyanamide was converted through urea into ammonia within a few days. Nitrate accumulation from calcium cyanamide was less complete and slower than from ammonium sulfate. In one soil the nitrogen from calcium cyanamide remained as ammonia for several weeks, the nitrate content being below that even of unmanured soil. Where the ammonia from calcium cyanamide remained for several weeks, tillering of barley was more rapid and the final yields and nitrogen contents were higher than with ammonium sulfate. It is suggested that the young barley plant utilises ammonia nitrogen more readily than nitrate provided the ammonia is thoroughly distributed through the soil.

"It is clear that the amount of nitrate obtained in nitrification tests should not be used as a measure of the relative values of calcium cyanamide and other nitrogenous fertilizers."

Nitrogenous composition of ammoniated peat and related products, L. A. Pinck, L. B. Howard, and G. E. Hilbert (*Indus. and Engin. Chem.*, *27* (*1935*), *No. 4, pp. 440–445, figs. 3*).—The authors report upon a chemical investigation of ammoniated peat, lignin, dextrose, and starch made at the U. S. D. A. Bureau of Chemistry and Soils. These substances were fractionated by various solvents, and the distribution of the nitrogen was determined. Urea was found to be the only common product present in large quantities. "It is apparently formed from carbon dioxide liberated during the ammoniation. The remaining organic nitrogenous compounds present a rather complex mixture in which no single individual occurs in appreciable amounts. A considerable amount of a complex, highly insoluble, nitrogenous polymerization product is formed in the ammoniation of these related materials."

The results recorded indicate that both the carbohydrate and lignin units of peat are extensively ammoniated.

Production and use of potash, C. A. Browne (*Com. Fert., 51 (1935), No. 4, pp. 9–14, 31, 33*).—This contribution from the U. S. D. A. Bureau of Chemistry and Soils briefly outlines some of the varied activities of the German potash industry, then sketches the history of the potash industry in the United States from the colonial and later extraction of crude potassium salts from wood ashes for the domestic and export markets through the economically unsound manufacturing methods necessitated by the sudden cutting off of foreign supplies during the World War to the present large production and greater production capacity built upon adequate technological research.

Potassium sulfate from polyhalite: Extraction from aqueous mixtures in which calcium sulfate is synthesized, E. P. Schoch (*Indus. and Engin. Chem., 27 (1935), No. 4, pp. 467–473, figs. 3*).—The author describes four processes designed for the commercial production of potassium sulfate, the first three of which were not found economically feasible. Of the fourth process, he states that "lime slurry and polyhalite are heated separately to a desired temperature (e. g., 220° C.) and are mixed in the presence of such an amount of water as to produce potassium sulfate solutions with concentrations as high as possible, yet far enough below the equilibrium concentration to obtain immediately a solid practically free from pentasalt. Thus the time of treatment is reduced to 15 min., and solutions can be obtained containing about 13.7 g of potassium sulfate per 100 g of water (about one-tenth of this being in the form of hydroxide), and the magnesium can be easily converted entirely to light carbonate of magnesia. Finally . . . the large amount of anhydrite obtained can be readily converted to plaster. Thus polyhalite appears to be economically usable."

The effect of lime and neutral calcium salts upon the solubility of soil potassium, M. Peech and R. Bradfield (*Amer. Soil Survey Assoc. Bul. 15 (1934), pp. 101–106, figs. 3*).—The authors report the results of an investigation carried out at the Ohio Experiment Station, from which they conclude that calcium does not facilitate the conversion of the exchangeable potassium of colloidal clay into less exchangeable forms; that increases in adsorbed calcium favor the adsorption of potassium by clays from neutral potassium salts, and increases in Ca^{++} ion concentration result in the liberation of the adsorbed potassium; that adsorbed hydrogen is replaced more readily than adsorbed calcium by potassium from salts of weak acids, despite the relative position of Ca and H in the lyotropic series, due to the formation of a weak acid; that since a neutral salt of calcium, like $CaSO_4$, will not appreciably increase the amount of calcium on the clay by replacing the adsorbed hydrogen, the free Ca^{++} ions brought into solution will liberate the adsorbed potassium regardless of the initial degree of calcium saturation of the clay; and that "the data obtained are in accord with the following well-established generalization in base-exchange reactions: The replacement of adsorbed cations is governed by (1) the nature of the ion as revealed by its position in the lyotropic series, (2) the concentration of the ion, as determined by degree of dissociation and solubility of the end products resulting from the exchange reaction."

Methods for reducing the retail cost of cotton fertilizers, W. H. Ross and A. L. Mehring (*Yearbook Com. Fert., 1935, pp 21–26*).—The authors of this contribution from the U. S. D. A. Bureau of Chemistry and Soils present data showing "(1) that for most of the cotton-producing States the saving to the farmer by the elimination of filler is about the same as though the wholesale cost of phosphoric acid were cut in half; (2) that the saving to the farmer in the reduction of the wholesale price of potash in a 3–9–4 mixture would be less than half of that for a corresponding reduction in the wholesale price of either nitrogen or phosphoric acid; (3) that the combined saving in the elimination of organic nitrogen and of side dressing, where either change does not interfere with the efficiency of the fertilizer, amounts to more than if the wholesale cost of either nitrogen or phosphoric acid and potash were cut in half; and (4) that the farmer who uses double-strength fertilizers makes more than twice as great a saving in his fertilizer bill as would be possible from . . . any one of the other single methods for effecting a saving in the retail cost of fertilizers.

"It is recognized that the supply of double-strength goods is limited at present, and that the price might advance for a time with a greatly increased demand for fertilizers of this kind. There would be no justification, however, for accompanying an increase in the analysis of fertilizers, because of the elimination of filler, with a rise in retail costs. A marked reduction in the retail cost of fertilizers thus seems possible apart from that which would result from a decrease in the cost of producing nitrogen, phosphoric acid, or potash."

Commercial fertilizers, 1935, E. R. Tobey (*Maine Sta. Off. Insp. 157* (*1935*), *pp. 75–116*).—In addition to the statement in the usual form of the results of fertilizer analyses for 1935, this publication contains the text of the fertilizer law and other data.

AGRICULTURAL BOTANY

Plant physiology, M. Thomas (*Philadelphia: P. Blakiston's Son & Co., 1935, pp. XII+494, figs. 57*).—"The present book has been written to assist students who wish to develop the knowledge of plant physiology that they have acquired in general courses on botany given in the higher forms at school or in the first year at a university. It is therefore hoped that it will prove useful to students of chemistry, physics, agriculture, and other subjects, who have acquired such knowledge, as well as to students who are making a special study of botany." An elementary knowledge of physics and chemistry is assumed.

The text treatment of the subject is included under the general headings of protoplasm; the absorption, translocation, and elimination of water, solutes, and gases; nutrition and metabolism; and growth and movement. Appendixes discuss organic compounds with and without nitrogen, and physical chemistry. A bibliography of 168 titles and author and subject indexes are included.

[Studies in agricultural botany by the Bureau of Plant Industry] (*U. S. Dept. Agr., Bur. Plant Indus. Rpt., 1935, pp. 19, 20, 25*).—Data are reported on studies of the sensitivity of seeds to light in different regions of the spectrum and of the chemical elements essential in minute amounts for plant growth.

[Botany and plant physiology studies by the Maryland Station] (*Maryland Sta. Rpts. 1934, p. XXIII; 1935, p. XXIV*).—Studies are briefly summarized in the 1934 report on the physiological and biochemical aspects of vegetable storage and the symptoms of mineral deficiencies in plants, with special reference to tomatoes, and in the 1935 report on after-harvest changes in green snap beans.

Photoelectric apparatus for measuring leaf areas, D. E. H. Frear (*Plant Physiol., 10 (1935), No. 3, pp. 569–574, figs. 3*).—In this paper from the Pennsylvania Experiment Station "an apparatus is described for the measurement of leaf areas by means of the photoelectric cell. The chief advantages of the method are its rapidity and simplicity, with a high degree of accuracy. The methods of standardization and calculation are given in detail. The apparatus has been used to determine the area of more than 10,000 apple leaves, with an error of approximately 3 percent."

A new fixing fluid and a revised schedule for the paraffin method in plant cytology, L. F. Randolph (*Stain Technol., 10 (1935), No. 3, pp. 95, 96*).—This is a contribution from the [New York] Cornell Experiment Station in cooperation with the U. S. D. A. Bureau of Plant Industry.

A rapid combined fixing and staining method for plant chromosome counts, E. Backman (*Stain Technol., 10 (1935), No. 3, pp. 83–86*).—The author describes a new method for rapidly preparing slides for chromosome counts by the use of a combined fixing and staining fluid, involving the substitution of anthraquinone for picric acid in Bouin's formula and the addition of alizarin red S with a metallic salt as a mordant.

A permanent root tip smear method, H. E. Warmke (*Stain Technol., 10 (1935), No. 3, pp. 101–103, figs. 3*).—The method described was devised for the study of chromosome numbers and morphology in those plants in which the chromosomes are so large and closely packed that paraffin section technic is totally inadequate.

The transfer of fungus cultures to section preparations [trans. title], M. von Olgyay (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 45 (1935), No. 9–10, pp. 474–477, pl. 1, fig. 1*).—The method described involves the preliminary embedding of superficial fungus elements in beaten egg white so as to show them in place in the final Canada balsam slides of sectioned plant tissues, etc.

Rapid weighings with a Troemner solution balance, E. T. Bartholomew and E. C. Raby (*Science, 82 (1935), No. 2133, p. 468, fig. 1*).—This contribution from the University of California describes a modification of this balance facilitating the making of correct readings.

Kinetics of photosynthesis, E. C. C. Baly (*Nature [London], 134 (1934), No. 3398, p. 933*).—Previous equations expressing the velocity of photosynthesis during the photostationary state having proved inaccurate, the author proposes the following: "$y=k_1I(bA-x)=k_2xe^{-Q/RT}$, whence $\log\frac{y}{K-y}=\log\frac{k_2}{k_1I}-\frac{Q'}{T}$ where A is the total concentration of cholorophyll in the irradiated surface, b is the fraction which exists as the complex, $K=k_1IbA$ and $Q'=Q/2.303R$.

"These equations indicate that the temperature coefficient is independent of the CO_2 concentration and that the rate in flashing light is a direct function of the CO_2 concentration, since b is a function of that concentration."

Light as an ecological factor and its measurement, H. L. Shirley (*Bot. Rev., 1 (1935), No. 9, pp. 355–381*).—This is a comprehensive and critical review of experimental work involving studies with artificial light and climate, the measurement of the daily course of photosynthesis in plants grown in natural habitats and the correlation of the photosynthetic rate with the light, carbon dioxide supply, stomatal aperture, temperature, etc., and the determination of the rate of growth of plants in various habitats.

The light conditions are grouped into (1) variations due to differences in latitude, altitude, and climate, and (2) those due to local obstructions, such as forest canopies. Both classes of variations include differences in the light intensity and quality. The detailed discussion includes light-climate and its effect on plants, light in local habitats and in the forest, light requirements as to intensity and quality, other factors varying with light in the forest, light and succession, and light measurement.

The development of instruments and technic for measuring light adapted to ecological use is reported to have advanced rapidly during the past 10 yr.

Histological variations in cosmos in relation to photoperiodism, O. Biddulph (*Bot. Gaz.*, *97* (*1935*), *No. 1*, *pp. 139–155*, *figs. 29*).—Plants of the Klondike variety of *Cosmos sulphureus* reacting most readily to short-day treatment required 7 short days for the initiation of the flower primordium and the slowest reacting plants 10 days. Given the absolute minimum treatment necessary to induce flowering, followed by long days, there was a tendency toward the production of interphases between normal flowers and vegetative shoots. The change of the primordium from foliar to floral was accompanied by a marked acccumulation of carbohydrates and proteins in the stem tip. There is a probable proteolysis and a decrease in proteins in the stem base at the time of the conversion of the primordium to the flowering state, and also a hydrolysis of carbohydrates in the stem base and their removal to the stem tip at the same time.

The shortened light period caused a decrease of 1 percent per day in the total materials stored. There was a diurnal fluctuation of glutathione in the stem tip during the first 7 days of the short-day treatment, but from the time of the actual anatomical shift of the primordium from the vegetative to the flowering phase the total glutathione remained permanently higher. Asparagine was somewhat higher and ammonium somewhat lower in the stem tip during flower bud formation.

Some effects of the photoperiod on development of Impatiens balsamea, J. P. Austin (*Plant Physiol.*, *10* (*1935*), *No. 3*, *pp. 545–552*, *figs. 2*).—Plants of *I. balsamea* were grown under 8-hr., normal (from 12 to 15 hr.), 16-hr., and 20-hr. photoperiods and data obtained on leaf area, age at budding and flowering, and development of the main axis. The results indicated the species to be intermediate between the long- and short-day types of plants and brought out further facts as follows:

The leaf area is about the same under the three longer, but much less under the shortest, photoperiods. The flowering time is influenced by the length of the photoperiod primarily through its effect on the initiation of flower buds. There must be a critical duration of photoperiod (from 12 to 16 hr.) with respect to the age at which flower buds are initiated. The optimum for stem development appears to be about 16 hr., but the effect of length of photoperiod on budding seems to be, to a considerable degree, independent of its effect on stem development.

Factors rendering the plasmolytic method inapplicable in the estimation of osmotic values of plant cells, E. C. M. Ernest (*Plant Physiol.*, *10* (*1935*), *No. 3*, *pp. 553–558*, *figs. 2*).—"The relationship between concentration of plasmolyticum and time required for plasmolysis is considered from a theoretical standpoint and the conclusion reached that considerable time is necessary before equilibrium is attained between a cell and a surrounding fluid of only slightly greater or slightly less osmotic strength. Data on this relationship are presented. When mechanical injury and the pathological actions of fluids from ruptured cells are eliminated, and when temperature and light are those of normal laboratory conditions, plasmolysis is a slow process; and limiting plasmolysis is so much deferred that secondary changes must be expected to have occurred in the cells such as would render invalid the interpretation of plasmolysis data as any measure of the osmotic value of the contents of plant cells."

Further investigations on the mechanism of cell elongation and the properties of the cell wall in connection with elongation.—I, The load extension relationship, A. N. J. Heyn (*Protoplasma, 19 (1933), No. 1, pp. 78–96, pl. 1, figs. 7*).—This is a study of the changes in length of the cell wall of the coleoptile of *Avena sativa* by the use of a self-recording extensometer. Load extension curves of the normal and plasmolyzed epidermis and coleoptile are given. The curves are interpreted with the aid of microscopic observations in which a crinkled inner surface is seen on the inner face of the walls of the epidermal cells when mounted in water. These crinkles disappear when the epidermis is stretched, and they are evidently due to contraction of other parts of the tissue, the outer tangential layers of the epidermis being suggested. It is concluded that the cell wall consists of layers with different properties, the outer of which have greater extensibility. It is this part of the wall which is responsible for the greater extension of the first part of the load extension curve. The slighter extension, under heavier loads, represents a very small elastic extensibility which is due to the inner layers of the wall.—(*Courtesy Biol. Abs.*)

Moisture movement in coniferous wood below the fiber-saturation point, S. J. Buckman and L. W. Rees (*Minnesota Sta. Tech. Bul. 108 (1935), pp. 19, figs. 4*).—Blocks of green wood 2.5 by 2.5 by 5 cm were cut to conform to the three structural directions in six different coniferous species, and in two cases from both heartwood and sapwood. They were dried uniformly to approximately 5 percent moisture content, coated with vulcanized rubber latex and shellac so as to confine the water movement to one structural direction, and then held at 95 percent relative humidity and 30° C. for observations as to the increase in moisture content with time.

A relationship was found between the specific gravity and the rate of percentage increase in moisture content. For longitudinal moisture movement, the results showed a straight-line relationship for both heartwood and sapwood of different kinds of coniferous wood having a range in specific gravity from about 0.35 to 0.55. For the radial and tangential directions, the deviations from a straight-line relationship were sufficiently large to suggest that the rate of percentage increase in moisture content for movement in these structural directions may be somewhat characteristic for the different kinds of wood. The rate in the longitudinal was about 5 times that in the radial and tangential directions. The rates in the heartwood and sapwood of Norway pine and white spruce did not differ significantly.

The data presented are believed to show that moisture moves in coniferous wood below the fiber-saturation point predominantly by bound liquid diffusion through the cell walls and by vapor diffusion across the cell cavities. The rate of diffusion of vapor across the cell cavity was of the order of magnitude of 100 times the rate of diffusion through the cell wall.

The significance of potassium for chlorophyll synthesis in plants [trans. title], G. Rohde (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 45 (1935), No. 9–10, pp. 499–510*).—This is a critical review of the subject, and includes 74 literature references.

Solubility of potassium in corn tissues, V. H. Morris and J. D. Sayre (*Plant Physiol., 10 (1935), No. 3, pp. 565–568*).—From cooperative studies between the U. S. D. A. Bureau of Plant Industry and the Ohio Experiment Station, it is shown that the potassium in corn tissues is entirely in solution in the cell sap and thus can be determined as well by analysis of the expressed sap as by that of the extracted or dried tissues. "With the possible exception of cob tissue, there is no evidence of the presence in corn tissues of any insoluble, fixed, or unionizable forms of potassium."

In what degree can K, Na, Ca, and Mg replace one another in plants? [trans. title] J. G. Maschhaupt (*Dept. Econ. Zaken* [*Netherlands*], *Verslag Landbouwk. Onderzoek., No. 40 A* (*1934*), *pp. 1025–1096; Ger. abs., pp. 1093–1096*).—Ash analyses of crop plants made over a period of 25 yr. at the experiment station at Groningen, Netherlands, are reported as showing that the fluctuations which appear in the potassium content of plants under the influence of soil composition and manuring are usually correlated with the reverse fluctuations in the soil content of other bases. In fact, this correlation was so close that the total bases in the normal plant fluctuated within rather narrow limits so long as the available supply was sufficient, and this notwithstanding differences in soil type or manuring.

A study of the assembled data apparently indicates that the role of potassium in the plant metabolism can in many cases be taken over by one or more of the other bases, but that this can occur only with an insufficient supply of potassium. Moreover, it is not always the same base which in different plants replaces the potassium, as was apparent from experiments with turnips, potatoes, peas, flax, oats, clover, grass, etc.

The definitely significant differences in potassium content shown by turnip and clover plants grown in different soils favor the idea that it may be possible by ash analyses of these or other plants to gain an insight into the relative supplies of available potassium in soils of different types and ages. In any case, such experiments, combined with chemical studies of the soils concerned, can surely contribute to the furtherance of knowledge of the base relations of soils. It is, of course, obvious that comparative studies should be made on plants grown under similar climatic conditions and harvested at like growth stages.

The author's review of the literature pertinent to the subject also supports the view that, in general, sodium, calcium, and magnesium may be substituted for potassium in the plant economy.

Influence of sulphur deficiency on the metabolism of the soy bean, S. V. Eaton (*Bot. Gaz., 97* (*1935*), *No. 1, pp. 68–100, figs. 2*).—In the experiments here reported considerable time was required for sulfur-deficiency symptoms to become apparent, but they began to show at 4 weeks and were pronounced at 6 weeks. The main symptoms were the yellowish green color of the leaves, the smaller leaflets, and the thinner stems. Stem elongation was prominent in both the plus and the minus sulfur plants because of the use of electric light for a part of the light period. Sulfur deficiency affected the tops more than the roots and increased the hardness of the stems. Cell wall thickness was correlated with an accumulation of carbohydrates. Characteristic symptoms of boron deficiency appeared in a number of soybean plants grown in 1933, but it is not thought that this affected the differences between the plus and minus sulfur plants. The tops of the plus sulfur plants were more succulent than those deficient in sulfur.

Nitrates accumulated in the minus sulfur plants due to poor nitrate assimilation, and starch and hemicelluloses were also higher, but the sugars accumulated in the plus sulfur plants. Sulfur deficiency apparently affected the form of carbohydrates accumulated. In the soybean, hemicelluloses apparently may serve as reserves. The soluble organic nitrogenous fractions were higher in the minus sulfur plants, especially in the stems. This was at least partly due to proteolysis, and is important in relation to the stem elongation in the minus sulfur plants. With proteolysis there was usually also a decrease in carbohydrates. The minus sulfur plants were higher in starch and hemicelluloses but lower in sugars, showing the proteolysis to be of a special type. The accumulation of soluble organic nitrogenous fractions in the minus sulfur plants was probably due in part to their new synthesis and to the failure of protein synthesis to reach completion from lack of sulfates. This may have some relation to the elucidation of the abnormal situation with regard to the accumulation of carbohydrates during proteolysis.

Comparisons are made between the effects of deficiencies in sulfur and in other elements in soybeans and between the effects of sulfur deficiency in soybeans and in other plants. Similar effects of sulfur deficiency were observed in sunflower, kale, rape, and mustard. In mustard, a reduction in the mustard-oil content was definitely evident.

Accumulation of boron by reciprocally grafted plants, F. M. Eaton and G. Y. Blair (*Plant Physiol., 10 (1935), No. 3, pp. 411–424, figs. 3*).—The authors found a high variability in the extent to which different species of plants took up boron, and even in the individual plant it was not uniformly distributed but tended to accumulate in some parts to a much greater extent than in others. Within particular organs also the accumulation was not uniform, since there was 36.6 times as much in the margins of lemon leaves analyzed as in the midveins and petioles. It is postulated that boron is carried to the leaves by the transpiration stream as an inorganic radical, but that in the leaves much of it combines with rather immobile organic compounds.

The concentrations of boron accumulating in the leaves of the scion were directly influenced by the rootstock, the scion leaf concentrations being reduced when grafted on varieties normally accumulating less, and increased when grafted on varieties accumulating more, boron. In one series of these tests reciprocally grafted sunflowers and Jerusalem-artichokes were used, and in another lemons and Chinese box oranges (*Severinia buxifolia*). However, boron absorption was not wholly contingent on the rootstock used, since Eureka walnuts accumulated more boron in their leaves than the Payne variety when both were grown in the same cultures on black walnut roots. Furthermore, different species accumulating comparable amounts of boron in their leaves may show marked differences in the severity of the injury induced.

It is concluded that, other conditions being equal, the absorption rate of boron is determined by (1) the characteristics of the absorbing root cells and (2) the nature of the boron compounds within the plant and the equilibria between the mobile and nonmobile forms. The mobility of boron within the plant or the proportions between the mobile and nonmobile forms, would be expected to affect both the distribution of boron in different parts and the concentration in the root cells, and thus of the absorption rate. The relationships of these facts to the practical choice of rootstocks are discussed.

Bibliography of references to the literature on the minor elements and their relation to the science of plant nutrition, compiled by L. G. Willis (*New York: Chilean Nitrate Ed. Bur., Inc., 1935, pp. 455, [figs. 6]*).—During the last few years it has been increasingly realized that many elements to which attention had been given are quite as essential for the proper growth of plants as the "big ten" of former years. This comprehensive bibliography with abstracts has been prepared in the hope that it will be useful to many of the agricultural chemists who are working on problems connected with the minor elements and their relation to plant nutrition.

Following the foreword there is an introductory summary of the subject by the compiler. The individual abstracts are arranged under the headings of the 48 elements with which they are concerned, and a literature list of 367 titles refers to published material mentioned in the texts of the abstracts. A section on soil deficiencies in relation to plant diseases is included. A complete analysis of Chilean nitrate is appended, showing it to contain 32 elements. It is believed that a part of its value as a fertilizer lies in the balance of many elements which it contains. An index is provided.

Nutrient-solution purification for removal of heavy metals in deficiency investigations with Aspergillus niger, R. A. Steinberg (*Jour. Agr. Res.* [*U. S.*], *51* (*1935*), *No. 5*, *pp. 413–424*).—"Purification of the nutrient solution for the removal of heavy metals may be accomplished by treating the nutrient solution with calcium carbonate and filtering while hot. The method is not critical and gives good results with iron, zinc, copper, and manganese under a wide variety of conditions and procedures. The removal of heavy metals appears to be dependent on their coprecipitation with an alkaline earth as phosphate, carbonate, or hydroxide by a decrease in acidity. The use of adsorbent charcoal to supplement the action of an alkaline-earth purificant is unnecessary and causes a decrease in experimental precision. Extraction of the spores of *A. niger* with alkaline solutions effects partial removal of iron, copper, and manganese stored in the spores in preparation for subsequent growth, and so leads to an accentuation of deficiency effects with these metals."

Physiological rôle of asparagine and related substances in nitrogen metabolism of plants, A. E. Murneek (*Plant Physiol.*, *10* (*1935*), *No. 3*, *pp. 447–464*).—In this contribution from the Missouri Experiment Station, the author gives an extensive and critical review of the literature of the subject (with a bibliography of 56 titles), presenting some of the typical results of investigations of certain parts of the major phases of the problem under the following main headings: Nitrogen metabolism of seedlings, nitrogen metabolism in leaves, and some factors affecting asparagine formation (effects of oxidation, anesthetics, and carbohydrates: synthesis of asparagine from ammonium (NH_4) salts, ammonia (NH_3), and organic acids; and organic acids as direct receptors of ammonia). A schematic table indicates the analogy between asparagine in the higher plants and urea in plants and animals.

From the discussion it is deemed apparent that there are in plants various means of removing and neutralizing NH_3, the most important factors in the mechanism being carbohydrates, pH, and chemical source of the NH_3. These amides (asparagine and urea) appear not to be the direct products of protein hydrolysis, but rather to arise from secondary synthesis with NH_3 as the key ion, the NH_3 coming mostly from the oxidation of amino acids. Both may be synthesized in plants when NH_3 is introduced, with the difference that for synthesis of asparagine a part of the unoxidized carbohydrate is necessary while for urea formation NH_3 and CO_2 are sufficient. The physiological function of both processes is apparently the neutralization and storage of NH_3, which seems to be toxic to organisms. Neither plants nor animals can synthesize the respective amides from NH_4 salts of strong acids, but they are able to do so from the more neutral salts.

The further metabolic role of the two amides differs in plants and animals. Urea is excreted from animals. On the other hand, asparagine remains in the plant cells as a nitrogen reserve which, with renewed carbohydrate supply, can be used again for the production of amino acids and other protein components.

Pantothenic acid as a nutrilite for green plants, R. J. Williams and E. Rohrman (*Plant Physiol.*, *10* (*1935*), *No. 3*, *pp. 559–563*).—"Pantothenic acid has been found in preliminary experiments to have a growth stimulating effect on green plants. The questions of whether it is stimulative or indispensable, where it originates in nature, and the probability of the existence of other plant nutrilites are discussed."

Distribution of roots in porous and nonporous plant containers, L. H. JONES and H. D. HASKINS (*Plant Physiol., 10 (1935), No. 3, pp. 511–519, figs. 3*).—This study at the Massachusetts Experiment Station was initiated to obtain more definite information on the top: root ratios in porous and nonporous plant containers and on the relation of nutrients to root distribution, with the following results:

The root systems in porous pots occurred mostly next to the wall of the pot, while in nonporous containers they ramified throughout the soil with but a very small proportion next to the container wall.

The size of the root system was influenced by the soil moisture content. When kept about equal in porous and nonporous containers, the root systems were also nearly equal.

Determinations of water-soluble solids made at intervals of 4, 8, and 12 weeks indicated an unequal distribution in the porous pots, the amount, in general, decreasing directly as the concentric cores were measured from the center outward. Detailed analyses made of the composite samples of the four cores indicated that all the elements determined followed the same general rule of decreasing in concentration from the center outward.

Cement pots are porous to air but do not maintain a lateral movement of moisture. The root systems in cement pots ramify throughout the soil as in nonporous pots.

The distribution of root systems in plant containers is shown to be associated with the distribution of nutrients. The latter, in turn, is affected by soil moisture movements.

Preliminary studies in the anatomy of the gynoecium of cotton with reference to boll dehiscence, P. ABRAHAM (*Assoc. Econ. Biol., Coimbatore, Proc., 2 (1934), pp. 22–32, pls. 2*).—In the indigenous cottons of Madras the dehiscence of the bolls is rather poor in *Gossypium indicum* as compared to that in *G. herbaceum*. An examination of the gynecium in these cottons revealed certain anatomical features which apparently have a bearing on this process. In all cottons the placental bundles of each carpel arise separately from the receptacular stele, immediately fuse together, and branch out again when they run through the placentas. In dehiscence the cleavage of the carpels stops just above the region of fusion. In the varieties of *G. indicum* this region of fusion extends much higher than in all other Indian cottons examined, resulting in a poor bursting of the bolls.

From genetic studies in progress, the indications are that this character of poor dehiscence is a simple recessive.

Origin of the fringe tissue of the cotton seed, R. G. REEVES (*Bot. Gaz., 97 (1935), No. 1, pp. 179–184, figs. 8*).—In this study at the Texas Experiment Station, the fringe tissue (often termed "perisperm") of the cottonseed is shown to originate as the inner epidermis of the inner integument.

Budless internodes treated as cuttings [trans. title], H. MOLISCH (*Ber. Deut. Bot. Gesell., 53 (1935), No. 6, pp. 575–586, figs. 3*).—A correlation was found between the bud and the formation of roots on cuttings. The experiments reported indicate that a growth-promoting substance is present in the bud which migrates to the region of the cut surface and there induces root development. In budless internodes this substance was lacking, and hence root formation either ceased or was visibly weakened.

The presence of buds also distinctly influenced the length of life of the internodes, since those without buds died within from 6 to 9 mo., while those with buds lived indefinitely.

Details of the behavior of various plant species handled as cuttings are described.

Observations and experiments on sex in plants, J. H. Schaffner (*Bul. Torrey Bot. Club, 62 (1935), No. 7, pp. 387–401, fig. 1*).—The results of experiments with *Thalictrum dasycarpum*, *Urticastrum divaricatum*, and *Zea mays*, in which changes in environmental conditions induced sex reversal, led the author to conclude that any sexual condition of an individual is determined not by Mendelian genes but by a physiological balance produced through the interaction of the general hereditary potentialities of the cell with the environmental conditions. There are no sex genes as such, and the gametophytes of heterosporous plants show that there are no sex-producing or sex-determining chromosomes, since the sex of the gametophytes and their gametes does not correspond to any special chromosome complement but always continues the condition previously determined in the gametophyte. It appears evident from the experimental data that all monecious and diecious species of plants are finally amenable to sex changes induced by the proper ecological influences.

The present status of the plant association, J. Pavillard (*Bot. Rev., 1 (1935), No. 6, pp. 210–232*).—From his critical review of the subject (involving 77 literature references), the author concludes that the plant association as defined by Braun-Blanquet (E. S. R., 66, p. 419) is the fundamental unit of plant sociology and that it is an abstract unit represented in nature by stands ("individus d'association", "Bestände"), large or small, and more or less scattered over the surface of the earth.

A close reciprocal relationship exists between the natural evolution of vegetation and the evolution of the soil. Controlled primarily by the climate, this evolution leads finally to the vegetational climax on mature soil. Before this stage each association represents a stage of fluctuating stability and duration.

There is a preface by one of the editors (H. A. G[leason]).

Duplications in Zephyranthes, H. H. Hume (*Bul. Torrey Bot. Club, 62 (1935), No. 7, pp. 403–411, figs. 5*).—This contribution from the University of Florida presents a brief, critical survey of the genus, with detailed taxonomic data on four species.

The gymnosperms, C. J. Chamberlain (*Bot. Rev., 1 (1935), No. 6, pp. 183–209, fig. 1*).—This paper constitutes a critical review of the researches of the preceding 30 yr. on the morphology, taxonomy, phylogeny, and to some extent the physiology of the gymnosperms, the cycadophytes and coniferophytes being considered separately. A literature list of 107 titles is included, and the editors present notes on the author's latest revision of his classic study on the subject[4] to furnish a general background for the accompanying article.

Proceedings of local branches of the Society of American Bacteriologists: North-central branch, Minneapolis, Minnesota (*Jour. Bact., 30 (1935), No. 3, pp. 329, 330, 331, 332*).—Among the abstracts of papers here presented are the following: Problems in nomenclature and classification now before the International Committee on Bacteriological Nomenclature, by R. S. Breed (from the New York [State] Experiment Station); concerning the alleged fixation of nitrogen by germinating peas, by E. M. Smyth and P. W. Wilson (from the University of Wisconsin); a growth factor for *Rhizobia*, by D. W. Thorne and R. H. Walker; and preliminary investigation of the occurrence and distribution of *Azotobacter* in Iowa soils, by W. P. Martin and R. H. Walker (the last two from Iowa State College).

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[4] Gymnosperms: Structure and evolution, C. J. Chamberlain. Chicago: Univ. Chicago Press, 1935, pp. XI+484, figs. 397.

Investigations concerning the nitrogen-fixing bacteria from the nodules of leguminous plants, H. G. Thornton (*Rothamsted Expt. Sta., Harpenden, Rpt., 1934, pp. 60–64*).—Notes given on the progress of investigations of the legume-nodule bacteria include the following:

Studies showed that the form on lucerne passes through the same life cycle in the soil, as already shown for artificial media, and this finding led to the wetting of the seed and the adding of calcium dihydrogen phosphate to facilitate the migration of the flagellate stage in the soil. An efficient strain of clover-nodule bacteria was found which could compete with the inefficient Welsh strain. It was found that following the cotyledon stage in lucerne and clover a substance stimulatory to the growth of the nodule bacteria is secreted, and the mechanism of infection of the root hairs was elucidated. Root hair infection and nodule formation were adversely affected by an excess of nitrates or ammonium salts, and the basis of this action was studied. The adverse effect of nitrates on a mixed crop of a legume with a nonlegume is explained on the basis of the competition by the more rapidly growing nonlegume. It is shown that the delicate equilibrium between the host and the nodule bacteria can be very readily unbalanced toward parasitism, and the conditions under which this occurs are discussed.

Medical mycology: Fungous diseases of men and other mammals, C. W. Dodge (*St. Louis: C. V. Mosby Co., 1935, pp. 900, figs. 142*).—This monumental work, originally based on a university course in medical mycology, summarizes the literature of the subject to the end of 1933, and also contains many literature references up to July 1, 1934. A relatively complete and accurate bibliography of the existing literature is presented, and the individual literature lists are placed at the ends of the various subject groupings. Keys to the families, genera, and species are copiously provided, and a general subject index is included. The earlier portions of the text deal, respectively, with the general morphology of the fungi; the physiology of the fungi, with special reference to reproduction (the section on H-ion concentration, by Mrs. C. W. Dodge); culture media, their preparation and sterilization; the isolation of microorganisms; microscopy, by M. Moore; and botanical nomenclature, including a historical survey and a complete reproduction of the International Rules of Botanical Nomenclature (1930).

The special portions, taking up the bulk of the work, deal with the fungus groups concerned. The viewpoints in the main are morphological, cultural, and taxonomic, though the sources and pathogenic relations (including the literature references) are briefly noted. Genera and species under the following groups are treated, including a large number of nomenclatorial changes, and the author gives a general discussion and notations on doubtful species under each fungus group: Mucorales (Mucoraceae); Endomycetales (Spermophthoraceae, Ashbyaceae, Pichiaceae, Ascoideaceae, Endomycetaceae, Dipodascaceae, Coccidioideaceae, Protomycetaceae, Taphrinaceae, Eremascaceae, Eremascaceae Imperfectae, Saccharomycetaceae, and Saccharomycetaceae Imperfectae); *Malassezia* (a genus of undetermined affinities); Plectascales (Gymnoascaceae, Trichophytoneae (Gymnoascaceae Imperfectae), Aspergillaceae, and Onygenaceae); and Fungi Imperfecti (Toruleae, Actinomyceteae, Sporotrichieae, and miscellaneous members of the group).

GENETICS

The relation of chromosome pairing to fertilization, G. M. Watkins (*Bul. Torrey Bot. Club, 62 (1935), No. 7, pp. 369–380, fig. 1*).—This critical review of the literature on the nature of the sexual process in plants and animals indicates that, in general, three definite phases are to be distinguished: Plasmogamy, karyogamy, and the pairing of the homologous chromosomes. From its effect on inheritance, the last named phase has been greatly emphasized. Different organisms vary strikingly in the interrelationships of these three phases of fertilization, and illustrative examples are given among the fungi, algae, higher plants, and lower animals.

A bibliography of 50 titles is appended.

A gene for control of interstitial localization of chiasmata in Allium fistulosum L., S. L. Emsweller and H. A. Jones (*Science, 81 (1935), No. 2109, pp. 543, 544*).—This preliminary report of cytological studies at the University of California gives evidence that the interstitial localization of chiasmata at IM in *A. fistulosum* is probably controlled by a recessive gene.

The inheritance of delayed germination in hybrids of Avena fatua and A. sativa, L. P. V. Johnson (*Canad. Jour. Res., 13 (1935), No. 6, Sect. C, pp. 367–387, fig. 1*).—Inheritance of germinability was studied at the Washington Experiment Station in reciprocal crosses between common wild oats (*A. fatua*) and Victory oats (*A. sativa*), the seeds of which are respectively nongerminable for several months and fully germinable shortly after harvesting. Studies of the F_1 to F_3 generations showed that germinability is genetically dominant over nongerminability (delayed germination). Germinability appeared to be inherited on the basis of three factors, more or less equal in potency, one factor being linked with that for grain type. At the time of testing, embryos having completely recessive genotypes were nongerminable; embryos having genotypes with one dominant allelomorph usually were nongerminable; embryos having genotypes with two dominant allelomorphs (of the same or different factors) were very largely germinable; and embryos and genotypes with three or more dominant allelomorphs were germinable. The germinative potentialities of genotypes seemed to vary with the period elapsing between harvesting and testing. There was some evidence that the linked factor has a greater germinative potency than either of the nonlinked factors. See also another contribution (E. S. R., 74, p. 479).

The effect of one and of two seedling lethals in the heterozygous condition on barley development, D. W. Robertson and W. W. Austin (*Jour. Agr. Res. [U. S.], 51 (1935), No. 5, pp. 435–440*).—Effects of the lethal seedling-factor (E. S. R., 69, p. 29) pairs A_ca_c found in Colsess I barley, $A_{c3}a_{c3}$ found in Colsess II, and X_cx_c found in Colsess IV, were studied at the Colorado Experiment Station as single heterozygotes in different plants and in combinations of double heterozygotes in different plants on mature-plant characters including number of culms, average length of culm, average length of head, total number of grains, and total grain weight, all per plant.

Colsess I (A_ca_c) and Colsess II ($A_{c3}a_{c3}$) both produced green and white seedlings in a 3:1 ratio but were different genetically. Colsess IV (X_cx_c) produced green and yellow seedlings in a 3:1 ratio and was linked to A_ca_c in Colsess I. No detrimental effects were found when heterozygous plants of Colsess I, Colsess II, and Colsess IV were compared with homozygous green plants of the same families, nor were any found in the characters studied when plants containing the factor pairs X_cx_c $A_{c3}a_{c3}$, double heterozygotes, were compared with pure green plants of the same families, or when plants containing the linked-factor pairs X_cx_c A_ca_c, double heterozygotes, were compared with related green plants from the same cross.

Macrosporogenesis and embryology of Medicago, D. C. Cooper (*Jour. Agr. Res. [U. S.], 51 (1935), No. 5, pp. 471–477, pls. 3*).—The macrosporogenesis and embryology of alfalfa (*M. sativa*) was studied at the Wisconsin Experiment Station preliminary to an investigation of causes of failure of seed setting in certain strains. Each ovule of *M. sativa* was observed to contain two or three primary sporogenous cells, which function directly as macrospore mother cells, one of which usually develops further. In consequence of the two meiotic divisions, a row of four macrospores is produced, of which the chalazal one develops into an 8-nucleate 7-celled embryo sac and the others disintegrate. Fertilization under greenhouse conditions occurs between 24 and 27 hr. after pollination. In the course of gametic union, the chromatic materials of the two gamete nuclei remain distinct until the equatorial-plate stage of the division of the zygote. A proembryo of six cells is formed, the embryo developing from its apical cell. Less than half of the 10 to 12 ovules found in each ovary show signs of fertilization. An average of 3 to 4 seeds per pod is produced in heavy seed-setting lines of alfalfa.

Character combinations in relation to endosperm development in interspecific Triticum crosses, J. B. HARRINGTON (*Canad. Jour. Res., 13 (1935), No. 6, Sect. C, pp. 388–399*).—The frequency of different character combinations in relation to seed plumpness in the F_3 of each of the crosses, Iumillo (*T. durum*) × Marquis (*T. vulgare*), Vernal (*T. dicoccum*) × Marquis, and Marquis × Black Persian (*T. persicum*), was studied at the University of Saskatchewan. The parents and hybrids were described earlier, with general analysis of the relation between seed plumpness and various morphological characters (E. S. R., 72, p. 600).

Some interspecific character combinations occurred frequently while others were rare, as expected, since the characters varied markedly in their frequency of interspecific combinations with other characters. The assumption that interspecific character combinations of value are to be found largely in plants from shrunken seeds rather than in those from plump seeds was not supported by the data. The plants from plump seeds had nearly as large a proportion of the combinations which were missing in plants from shrunken seeds as did the latter plants with respect to the former.

[Studies in animal genetics] (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt., 1935, pp. 4, 5, 14, 15*).—Litter size and feeding data obtained under record-of-performance conditions are reported for two strains of Chester White swine continued to the seventh generation by brother-sister matings; observations of differences in the various organs and glands, calcium and phosphorus content of the blood, and cytological analyses of the pituitary of inbred strains of guinea pigs; a new technic for artificial insemination in fowls, by which it was possible to make crosses between birds of widely different sizes; and a statistical study of the inheritance of rate-of-laying.

[Papers on genetics from the physiological laboratories of the Institute of Animal Husbandry, Lenin Academy of Agricultural Sciences], edited by M. M. ZAVADOVSKIĬ (ZAWADOWSKY) (*Leningrad: Vsesoiūzn. Akad. Selsk. Khoz. Nauk Lenina, 1935, pp. 7–170, 227–238, figs. 34*).—The following papers are presented in Russian and English:

Science and animal-breeding, E. F. Liskun (pp. 7–18).—An account is given of the plans and organization for studying problems relating to livestock production in the U. S. S. R.

The dynamics of the development of the organism, M. M. Zavadovskiĭ (pp. 19–119).—The progress made in the study of the physiology of reproduction in animals, with special reference to the regulation of the female sexual cycle for artificial insemination and the stimulation of lactation in rabbits, sheep, and cows, is reported.

Some problems and advances in zootechnical and experimental endocrinology, B. M. Zavadovskiĭ (Zawadowsky) (pp. 121–149).—Special attention has been given to studies of the endocrine function of the thyroid and pregnancy tests, based on the presence of folliculin and prolan in the urine and blood of pregnant animals. Other phases of endocrinology are being studied especially with reference to those to which particular importance may be ascribed.

Artificial insemination, O. F. Neiman (Neumann) (pp. 151–170).—The methods employed in Russia in the artificial insemination of the various classes of animals are described. It is pointed out that 92 percent lambs were obtained from about 2,000,000 artificially inseminated ewes, and that as many as 2,500 to 2,700 ewes were impregnated by one ram.

The problems of the physiology of lactation, G. I. Azimov (Asimoff) (pp. 227–238).—Progress in determining the hormones responsible for the secretory function of the mammary gland and the action of these substances on birds is reported.

Inheritance of wrytail in Jersey cattle, F. W. Atkeson and T. R. Warren (*Jour. Heredity, 26 (1935), No. 8, pp. 331–334, figs. 2*).—In studies at the Idaho Experiment Station the character "wrytail" in dairy cattle was found to be inherited as a simple Mendelian recessive in a Jersey herd. Three generations of normal sires were evidently homozygous and carriers of this recessive factor.

Halo-hairs on New Zealand Romney lambs, F. W. Dry (*Jour. Textile Inst., 26 (1935), No. 8, pp. T237–T241, pl. 1*).—A study is reported of the inheritance of the abundance of halo-hairs or large birthcoat kemp in New Zealand Romney lambs. The parents were classified according to the abundance of halo-hairs and the results interpreted to indicate that this characteristic was inherited on a multiple-factor basis, although the effects of some dominant genes for halo-hair production appeared comparatively large.

Silver guinea pigs, W. V. Lambert (*Jour. Heredity, 26 (1935), No. 7, pp. 279–283, figs. 2*).—The inheritance of silver, a new recessive color character in the guinea pig, is described from studies at the Iowa Experiment Station. Silver consists of white hairs in a pigmented coat and has been observed in guinea pigs of several different colors. However, the white hairs do not show until after the first coat is shed, and their appearance varies with age. The silver gene was an autosomal recessive, but the grade of silver was affected by modifying factors.

Silvering among the progeny of the cross of silver × nonsilver and in the backcross, F_2, and recessive matings was in substantial agreement with the monogenic mode of inheritance.

A recessive curly-hair character of the Norway rat, H. W. Feldman (*Jour. Heredity, 26 (1935), No. 6, pp. 252–254, fig. 1*).—The inheritance of a recessive curly-coat character in the Norway rat, designated as "kinky" with the symbol *k*, is described. This condition was found to be due to an autosomal factor. In the adult, hair regression does not seem to keep pace with an excessive breakage of hair, resulting in the appearance of bare spots on the shoulders and hips. The hair of kinky rats was finer than normal and flattened in cross sections, although this was variable.

Statistical studies on the inheritance of sexual maturity in White Leghorns and Rhode Island Reds, A. B. Godfrey and M. A. Jull (*Poultry Sci., 14 (1935), No. 6, pp. 346–350*).—The U. S. D. A. Bureau of Animal Industry presents the results of a statistical study on sexual maturity in White Leghorns and Rhode Island Reds bred at the Beltsville (Md.) Research Center during the years 1925–31, inclusive.

It was found that the mean sexual maturity of the White Leghorn pullets was significantly correlated with the sexual maturity of their dams, but not significantly correlated with the sexual maturity of their maternal or paternal granddams. With the Rhode Island Reds a significant correlation was found between the sexual maturity of the pullets and that of their dams and maternal granddams, but no significant correlation with the sexual maturity of their paternal granddams. Sires and dams differed significantly in their ability to transmit early sexual maturity to their daughters. Full sisters became sexually mature more nearly at the same age than half sisters or less related pullets. The White Leghorns were relatively more homogeneous for sexual maturity than the Rhode Island Reds.

The sequence of appearance, molt, and replacement of the juvenile remiges of some domestic birds, D. C. Warren and C. D. Gordon (*Jour. Agr. Res. [U. S.], 51 (1935), No. 5, pp. 459–470, figs. 4*).—A study was made at the Kansas Experiment Station of the time of emergence and molt of the remiges (flight feathers) in domestic birds during growth. The species studied were *Gallus domesticus* (White Leghorn, Rhode Island Red, and Light Brahma), *Numida meleagris* (Pearl var.) and *Meleagris gallopavo* (Bronze var.). The chickens, guineas, and turkeys agreed closely in the irregular sequence of emergence and molt of the axial feather and secondary no. 1. The various remiges emerged at about the same time in the White Leghorn chickens, turkeys, and guineas, but some remiges appeared somewhat later in the Rhode Island Reds and Light Brahmas. In chickens, a complete molt of the remiges usually occurred during growth, but the original outside (no. 10) primary feather occasionally was carried over into the adult period. A second molt, following the same sequence as the first one, was observed in some chickens when they approached sexual maturity. The sequence of the juvenile molt in the chicken did not agree with that of the molt normally occurring at the end of the laying year. There was considerable variability as to the period of holding the different remiges comprising the original set.

Effects of female sex hormone on plumage color, J. P. Quinn and W. H. Burrows (*Jour. Heredity, 26 (1935), No. 8, pp. 299–303, figs. 2*).—The cross of Black Sumatra males × White Wyandotte females produces solid black females, whereas the males show silver and gold in the hackle and saddle at about 4 mo. of age.

In studies at the Beltsville (Md.) Research Center, it was found that ovariectomizing the F_1 black females at 4 mo. of age resulted within 2 mo. in the appearance of red color in the wing bows and saddle, suggesting that the female was potentially gold, *s–Ec*.

A definite widening of the black stripe along the midline of the feather of the F_1 capons was induced by the administration of from 450 to 550 rat units of an aqueous solution of theelin. divided into 3 doses.

The rapidity and economy of this test for differentiating the existence of a genetic dimorphism between the two sexes were evident.

Failure of theelin and thyroxin to affect plumage and eye-color of the blackbird, C. H. Danforth and J. B. Price (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 5, pp. 675–678*).—No change in the color of the regenerating plumage or the eye color of the male Brewer's blackbird was brought about by the administration of theelin or thyroxin, in contrast to findings with other fowls.

The behavior in vitro of tissues from lethal embryos, B. Ephrussi (*Jour. Expt. Zool., 70 (1935), No. 2, pp. 197–204, figs. 2*).—It was found, in tissue culture, that tissues taken just before death from homozygous brachyure (lethal) mice could be grown for long intervals, indicating that the death of such embryos is due to internal factors.

Delayed implantation and discontinuous development in the mammals, G. W. D. Hamlett (*Quart. Rev. Biol., 10 (1935), No. 4, pp. 432–447, figs. 4*).—A summary of the evidence on delayed implantation, occurring especially in armadillos, roe-deer, badgers, martens, and bears, is presented. The failure of implantation to occur is thought to be due to the lack of the hormone of the corpus luteum. During the time the embryo is in the free-vesicle stage the corpora lutea enlarge, but implantation does not occur until active secretion from the gland starts.

Several theories of the cause of the discontinuous development were reviewed, and it was suggested that the condition seems more likely to be a useless character accidentally developed than a character having some definite role in the evolution and survival of the species.

Cornification of vaginal epithelium of ovariectomized rat produced by smearing, N. J. Wade and E. A. Doisy (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 5, pp. 707–709*).—Attention is called to the fact that spayed rats on which vaginal smears are made from one to three times daily may show a thickening of the vaginal epithelium with cornification comparable to that resulting from theelin administration.

Glutathione concentration of livers and muscles of rats following injection of hypophyseal growth hormone, H. Goss and P. W. Gregory (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 5, pp. 681–683*).—Continuing the studies previously noted (E. S. R., 74, p. 473), it was found that the glutathione content of the liver of rats given single injections of the growth hormone of the hypophysis decreased 30 percent in 8 hr. and 55 percent in 12 hr. as compared with controls. No significant changes were noted in the moisture content of the muscles, although there was a small but significant decrease in the moisture content of the livers of animals injected with the growth hormone.

The age factor in responsiveness to gonadotropic hormones, H. Selye, J. B. Collip, and D. L. Thomson (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 5, pp. 800–803*).—In attempting to differentiate the gonadotropic hormones of the hypophysis, the response of rats of different ages was tested. From the results it was concluded that there were two hypophyseal gonadotropic hormones, one which was follicle-stimulating and one which luteinized the theca and the mature granulosa but had no effect on the immature granulosa cells. It is considered that prolan A of menopausal urine closely resembles the former, whereas the placental hormone of pregnancy urine is more comparable to the luteinizing fraction.

Maternal behavior induced in virgin rats by prolactin, O. Riddle, E. L. Lahr, and R. W. Bates (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 5, pp. 730–734*).—Maternal behavior was induced by prolactin administration in 6 of 10 virgin female rats which had previously received doses of prolan or follicle-stimulating hormone for 5 days.

Reaction of ovaries of mature female rats to injections of oestrin, J. M. Wolfe (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 5, pp. 757–759*).—A study of the condition of the ovaries of 25 mature female rats which had received doses of 200 rat units of a concentrated oestrum-producing extract for 8 to 15 days showed that the normal number of corpora lutea were present, but that they were greatly increased in size as compared with those of the normal female rat during oestrum and were probably equal in size to those found in ovaries of rats killed during the latter half of pregnancy.

[Studies on the physiology of reproduction] (*U. S. Dept. Agr., Bur. Dairy Indus. Rpt., 1935, pp. 10, 11, 12, 13*).—Data are reported on the breeding efficiency of cows in an abortion-negative herd, with explanations of the cause of death of calves; tests of the morphology and physiology of spermatozoa in different media and of artificial insemination; and observations on the development of rabbit ova, the amelioration of senility and sterility in bulls, and the uterine motility of the cow uterus.

FIELD CROPS

[Crops research of the U. S. Department of Agriculture, 1935] (*U. S. Dept. Agr., Sec. Agr. Rpt., 1935, pp. 104–107*).—Brief progress reports with outstanding examples are given on breeding work with wheat for rust resistance, and the introduction and appraisal of species and varieties of grasses.

[Research with field crops in the Bureau of Plant Industry] (*U. S. Dept. Agr., Bur. Plant Indus. Rpt., 1935, pp. 2, 3, 4–6, 8–10, 16, 22, 23, 25*).—Brief reviews are given on the progress and accomplishments in breeding work with corn, wheat, oats, grain sorghum, rice, seed flax, hemp, cotton, sugarcane, red clover, alfalfa, sweetclover, lespedeza, crotalaria, and soybeans; varietal studies with cotton and soybeans; a study of the nature of hybrid vigor in corn; the production of sugarcane-sorgo hybrids; study of factors affecting the nicotine content of tobacco, and effects of weed growth on tobacco following; community production of cotton; adaptation and cultural tests with fiber flax; and studies of the protein content of Southern pasture grasses and of methods of reestablishing buffalo grass on cultivated land (E. S. R., 72, p. 468). Many of the studies were in cooperation with State experiment stations.

[Field crops work in Maryland, 1934 and 1935] (*Maryland Sta. Rpts. 1934, pp. XII–XIV, XV; 1935, pp. XIV–XVI, XXVI, XXVII, XXXII, XXXIII, XXXIV–XXXVIII*).—The progress of research with field crops is reviewed in these pages.

1934 Report.—Improvement work with barley and wheat, trials of alfalfa varieties, and planting tests with Kentucky bluegrass having different weights per bushel, are reported.

1935 Report.—Breeding experiments with barley (resulting in the development of Nobarb barley), sweet corn, potatoes, peas, and tobacco; fertilizer tests with potatoes, tomatoes, and tobacco; cold-hardiness studies with red clover; a study on the economic use of crop seed; and rotation and water supply studies and spraying plant beds for control of blue mold and wildfire, all with tobacco, are reviewed briefly. The tobacco investigations were in cooperation with the U. S. Department of Agriculture.

Factors governing yield of crops (Woodhouse Memorial Prize essay, 1932), R. G. JOGLEKAR (*Agr. and Livestock in India, 5 (1935), No. 6, pp. 683–691*).—Climatic and seasonal conditions, soil and fertility conditions, cultivation methods and field practices, planting material, insect pests and diseases, and general economic conditions are discussed as factors governing crop yields.

A study of the association between mean yields and standard deviations of varieties tested in replicated yield trials, F. R. IMMER (*Jour. Amer. Soc. Agron., 28 (1936), No. 1, pp. 24–27*).—Statistical examination of yields of corn, barley, oats, flax, and spring wheat strains and varieties in yield trials by the Minnesota Experiment Station led to the conclusion that, in variety trials in which the range in yield is not too great, the assumption of independence of mean yields and standard deviations of the separate varieties is valid.

Serial experiments, R. D. BOSE (*Agr. and Livestock in India, 5 (1935), No. 6, pp. 728–741*).—Results of yield trials with oats both at Pusa and at Karnal for three consecutive seasons, combined and calculated in the form of a serial experiment, are held to demonstrate the fallacy of deciding as to the inherent productiveness of different varieties from results of a single season and to show the need for serial trials to produce results of average reliability.

Vernalization experiments with forage crops, R. MCKEE (*U. S. Dept. Agr. Circ. 377 (1935), pp. 12, figs. 2*).—The seed of white lupine, crimson clover, hairy vetch, and Austrian Winter field pea, vernalized or started into growth by addition of moisture and then kept for 40 days at 0° C., came into flower and fruit when subsequently planted, while seed not so treated remained in the vegetative stage or bloomed at a later date. Lack of response by seed of white sweetclover and red clover may have been due to insufficient treatment. Seed of foxtail millet, Sudan grass, soybean, and crotalaria moistened and kept at high temperatures for 5 to 9 days usually showed decreased vigor, and such treatment did not advance the time of maturing. Seed moistened and started into growth activity and subsequently dried began to grow sooner than untreated seed. The absorption capacities of seed of a number of grasses and legumes as determined in these experiments, expressed in percentage of the air-dry weight of the seed, are given.

Relative production of feed grain from spring-grown cereals in Utah, R. W. Woodward and D. C. Tingey (*Utah Sta. Bul. 263 (1935), pp. 12, fig. 1*).—Leading varieties, including Federation and Dicklow wheats, Trebi barley, Swedish Select oats, and Minnesota No. 13 corn, were grown in cooperation with the U. S. Department of Agriculture on the same fields in a number of counties, 1931–34, and grain yields were used as the basis in comparing the relative acre production of feed produced. Oats surpassed all other cereals in bushels per acre and was closely followed by barley, whereas on the basis of pounds per acre, barley exceeded wheat, corn, and oats by 18, 27, and 31 percent, respectively. Similarly, on the basis of total digestible nutrients, barley exceeded wheat, corn, and oats by 17, 26, and 38 percent, respectively, and on relative feed value by 13, 23, and 38 percent, respectively. The data by individual counties showed considerable variation when cereals were compared on the basis of relative feed produced. Barley occasionally was outyielded by wheat and corn but never by oats. The production average for barley for the years tested was from 18 to 66 percent more per acre than for oats.

Cereal crop improvement for dry farming conditions, J. B. Harrington (*Sci. Agr., 16 (1935), No. 3, pp. 113–120, figs. 2; Fr. abs., p. 120*).—In a study of the suitability of different wheat and barley varieties to open plains conditions, 1925–34, made at the University of Saskatchewan, Reliance wheat yielded a total of 47.5 bu. more than Marquis during 1925–29, 5 favorable years, but only 2.9 bu. more in 1930–34, 5 dry years, and the interaction between varieties and years was significant. Two selections from Marquis outyielded Marquis by 27.1 and 28.8 bu., respectively, in 1925–29, but made 2.8 and 2.3 bu. less in 1930–34. Trebi barley totaled 74.4 bu. more than Hannchen in 4 favorable years and only 0.8 bu. more in 5 dry years. Some new oats obtained from the Ohio Experiment Station, hybrids 117, 121, 123, 132, and 137, exhibited a high degree of drought resistance but had not been tested in wet years. Indications were that even 5 yr. might be inadequate to reveal a variety's usefulness, and that the test period should be long enough to include both favorable and unfavorable years.

Cultural and rotational practices for dry land agriculture, E. S. Hopkins (*Sci. Agr., 16 (1935), No. 3, pp. 121–126*).—This article gives data on wheat yields secured on summer fallow and stubble land and the relative yields of hay crops and of corn at different experimental stations in Canada, and discusses frequency of summer fallowing in rotations, treatment of summer fallow, summer fallow substitutes, and methods of handling stubble, especially with the aim of controlling such weeds as wild oats.

A tentative recommendation of technic for grazing experiments on range pastures in arid or semi-arid regions (*Jour. Amer. Soc. Agron., 28 (1936), No. 1, pp. 81–83*).—These recommendations were prepared by G. Stewart, M. W. Talbot, and L. C. Hurtt.

Soil, field-crop, pasture, and vegetable-crop management for Erie County, New York.—II, Pasture improvement and management in Erie County, D. B. Johnstone-Wallace (*[New York] Cornell Sta. Bul. 630 (1935), pp. 56–87, figs. 19*).—The types of pasture in Erie County, N. Y., their botanical composition, and the plant food needs of important soil types carrying pastures are described, and suggestions are made for their improvement by fertilization, reseeding, and grazing management, and for the growing of supplementary pasture crops.

Pasture fertilization, F. D. Gardner, S. I. Bechdel, P. S. Williams, C. F. Noll, J. W. White, E. S. Erb, E. B. Coffman, G. C. Fuller, and O. R. Enlow (*Pennsylvania Sta. Bul. 323 (1935), pp. 24, figs. 8*).—A preliminary report is given on the effects during five grazing seasons of different fertilizer treatments on the botanical composition of the turf, yield of clippings and hay, and yield of total digestible nutrients as determined by chemical analyses and by grazing dairy cattle. Located at Kylertown, Clearfield County, on Dekalb silt loam, the experiment was made in cooperation with the U. S. Department of Agriculture.

Although definite conclusions are not yet drawn, the return per acre above fertilizer costs indicated that it was profitable to fertilize this permanent pasture. Light applications of nitrogen tended to give a smaller return than heavy ones. As a rule, midsummer applications of nitrogen did not give satisfactory results due to insufficient rainfall and above-optimum soil temperatures at the time they were applied. Phosphorus alone or phosphorus and potash when used with lime was more profitable than the lighter applications of nitrogen. The heavier applications of nitrogen stimulated a lush growth of grass which reached its peak of yield in May and June, but the plats heavily fertilized with nitrogen usually did not accommodate more grazing animals in late summer and fall than plats receiving phosphorus alone or phosphorus and potash without nitrogen.

The results to date indicate that "dairy cattle can be used quite satisfactorily for measuring the carrying capacity of pastures under different systems of fertilization."

The effects of sodium chloride on some turf plants and soils, V. T. Stoutemyer and F. B. Smith (*Jour. Amer. Soc. Agron., 28 (1936), No. 1, pp. 16–23, figs. 4*).—The effect of phosphorus and sodium chloride on some common turf plants and soils was studied in the greenhouse and laboratory at the Iowa Experiment Station. Phosphorus stimulated plant growth, especially of Kentucky bluegrass and white clover, but sodium chloride in the concentrations used (2,000, 3,000, and 4,000 lb. per acre) apparently was toxic in some cases and stimulative in others. This toxicity of sodium chloride was lessened somewhat by the phosphoric acid. Metropolitan bentgrass was more tolerant to sodium chloride than were Kentucky bluegrass, seaside bentgrass, Bermuda grass, or white clover. Significant differences in the effects of phosphorus and sodium chloride on the growth of the different plants were obtained. The total exchangeable base content of the soil was lowered by treatment with sodium chloride. Indications were that sodium chloride alone or with phosphate may be used on sandy soils for metropolitan and seaside bentgrass.

Alfalfa experiments at Stoneville, Mississippi, P. R. Henson and H. L. Westover (*U. S. Dept. Agr., Tech. Bul. 495 (1935), pp. 14, figs. 2*).—Investigations to determine the cause of alfalfa failures in the Mississippi Delta, carried on at Stoneville in cooperation with the Mississippi Experiment Station, included variety and fertilizer trials, rates and dates of seeding, cultivation, time of cutting, and tile- and surface-drainage tests. While some of the failures could be attributed to use of unadapted varieties, failure to cut at the proper growth stage, poor seedbed preparation, and to insect and disease injury, the major factor in successful alfalfa production is adequate surface drainage.

A preliminary survey indicated that the older soils of the Yazoo series and the better-drained phase of Sharkey clay in the eastern part of the Delta are acid, and alfalfa usually fails on them. Poor seedbed preparation was responsible in some cases for failure to secure good stands. Seed of common alfalfa from Kansas and adjoining States gave somewhat better results than seed from other sources, including northern cold-resistant and Hairy Peruvian and other nonhardy alfalfas. The nonhardy strains may be grown satisfactorily as far north as St. Joseph, La., but are not adapted to the northern portions of the Delta. Fertilizers did not appreciably increase hay yields or the life of the stands, and the quality or yield of hay was not increased by any method of cultivation. Indications were that alfalfa should be seeded from September 15 to October 15 at the rate of 15 to 20 lb. per acre. Cutting at the one-tenth- to one-half-bloom stage gave satisfactory yields without injuring stands appreciably The tests showed that the natural drainage on the level to nearly level areas of Sharkey clay "heavy buckshot" soils should be supplemented by building the fields up into lands with surface ditches spaced at regular intervals to drain the field more rapidly. The various insects and diseases found did not seem to be important factors in the alfalfa failures.

The influence of the hydrogen ion concentration of the soil on the growth of alfalfa [trans. title], A. ARENA (*Rev. Argentina Agron., 1 (1934), No. 2, pp. 116–132, figs. 3; Fr. abs., p. 131*).—Common alfalfa was grown during 2 mo. in a series of pots containing soil adjusted in reaction progressively from pH 5.4 to 8.7. Maximum growth took place under slightly alkaline conditions, pH 7.1 to 7.4, with the optimum about 7.4. The correlation between the pH of the soil and the yield, between the acid 5.8 and the optimum 7.4, was quite significant, $r=0.96$. Chemical analysis of the plants showed that the highest contents of ash and of protein corresponded to the acid or alkaline extremes in pH. The phosphorus and calcium contents were highest under extreme acid conditions. The results were in harmony with those of others, showing that alfalfa is quite sensitive to extreme acid conditions in the soil and attains its best development with pH about neutral or slightly alkaline.

The development of the barley spike, O. T. BONNETT (*Jour. Agr. Res. [U. S.], 51 (1935), No. 5, pp. 451–457, pls. 2*).—The morphological development of the spike of a 2-row and a 6-row barley was studied at the Illinois Experiment Station by dissecting the growing points from the stem. Stem development from germination to pollination could be divided into two phases. In the first phase, the stem internodes remain short and the growing point produces only leaf initials and its undifferentiated portion elongates. In its beginning the second phase is marked by elongation of stem internodes and the appearance of double ridges on the growing point; then the spike and its parts differentiate and develop in the order: Spikelet initials, empty glumes, lemma, palea, anthers, awn, and pistil. Early differences in time and rate of differentiation of spikelets in the different parts of the spike are maintained and account for some of the variation in size among spikelets of the mature spike. The number of spikelets at each joint of the rachis is limited, but since the barley spike is an indeterminate inflorescence, some response to environment can be made in the number of fertile spikelets at the spike tip.

Barley varietal tests in Utah, R. W. WOODWARD and D. C. TINGEY (*Utah Sta. Bul. 261 (1935), pp. 12, fig. 1*).—Trebi barley, the highest yielder in variety tests at the station, 1927–34, and in county tests, 1931–33, made in cooperation with the U. S. Department of Agriculture, has shown its superior yielding ability in different parts of Utah. It appeared undesirable at present to grow other varieties on irrigated lands where barley is grown for feed. The status of barley production in Utah is described, and the characteristics and yields of important varieties are noted.

Uniformity trials with cotton, F. Siao (*Jour. Amer. Soc. Agron., 27 (1935), No. 12, pp. 974–979*).—Analyses of yields of blank tests during 2 yr., comprising 200 24-ft. rows spaced 1 ft. apart and arranged in a 20×10 block, and also of yields from a somewhat different arrangement in 1932, both grown in Chekiang, China, are reported in this contribution from the University of Minnesota. Increase in plat size was accompanied by reduction in experimental error, but larger plats were less efficient than the smaller plats, indicating that increase in number of replications was much more efficient than increasing the size of plat. The shape of the plat was determined by the direction of soil variation, the increase in size in the direction of least association being most efficient. A definite number of replications could not be recommended because of high seasonal variation. Method of replication, i. e., systematic arrangement, randomized blocks, and Latin squares, were studied and differences between hypothetical varieties compared with calculated standard errors. Each gave good agreement with mathematical expectation.

Cotton varieties recognized as standard commercial varieties, H. B. Brown (*Jour. Amer. Soc. Agron., 28 (1936), No. 1, pp. 69–79*).—Brief descriptions are given of cottons recognized as standard commercial varieties by the American Society of Agronomy and the agronomists of the Association of Southern Agricultural Workers. These include Acala–5, Acala–8, New Boykin, Cleveland–5, Cleveland–884, Piedmont Cleveland, Wannamaker Cleveland, Cook–307–6, Delfos, Delta and Pine Land–8, Delta and Pine Land–10, Deltatype Webber, Dixie-Triumph, Dixie–14, Express–121, Lightning Express, Half and Half, Kasch, Lone Star, Mebane, Missdel, Station Miller, Mexican Big Boll, Oklahoma Triumph–44, Pima, Rowden, Arkansas Rowden–40, Toole, Stoneville, Trice, and Wilds.

The nitrogen, phosphorus, and calcium content of the cotton plant at pre-blooming to early boll stages of growth, H. F. Murphy (*Jour. Amer. Soc. Agron., 28 (1936), No. 1, pp. 52–57*).—Chemical analysis made at the Oklahoma Experiment Station, of plant parts, including the stems, leaves, and bolls from preblooming to early boll stages of growth, as well as of bolls at various stages of development, revealed a considerable absorption of calcium by the plant at this period, most being concerned with the vegetative part of the plant remaining in the leaves and stems. Intake of nitrogen and phosphorus also is high at this time, and while considerable of each is needed for the rather extensive vegetative growth occurring, boll development accounts for much of these elements in the mature plant.

Field results in a millet breeding experiment, H. W. Li, C. J. Meng, and T. N. Liu (*Jour. Amer. Soc. Agron., 28 (1936), No. 1, pp. 1–15*).—Results of field trials and field technic employed in an extensive millet-breeding project are described, supplementing another contribution (E. S. R., 74, p. 480).

Most efficient use of land resulted from plats 15 ft. long and two 1-ft. rows wide. When land is not a limiting factor, plats of the same width but 30 ft. long with replications corresponding in number to the smaller plats seems proper. Competition was apparent between varieties of millet. The competition coefficient was correlated significantly and positively with date of heading, negatively with yield, and insignificantly with plant height. Indications were that, in general, the low-yielding and late varieties profit from competition.

The closer spacings were accompanied by higher yield but less stooling per plant. Yields from different spacings, i. e., 2, 4, 6, 8, and 10 in. apart, did not differ significantly, whereas differences were significant for number of stools per plant.

Yield was correlated negatively with number of stools per plant, $r=-0.0514$: but positively with plant height, 0.5087; days to heading, 0.5345; length of head, 0.4886; and weight of 10,000 kernels, 0.4858. The multiple correlation coefficient, $R=0.7343$, was statistically significant. As to partial correlation coefficients, yield was correlated positively and significantly with number of stools, length of head, and weight of 10,000 kernels, and possibly with date of heading, but negatively and insignificantly with plant height.

Oat varietal tests in Utah, R. W. WOODWARD and D. C. TINGEY (*Utah Sta. Bul. 260 (1935), pp. 14, figs. 2*).—Markton oats has been outstanding in variety tests at the station, 1928–34, and in several counties in the State, 1931–33, made in cooperation with the U. S. Department of Agriculture. In the Statewide tests, Markton outyielded Swedish Select by an average of 10 bu. per acre. Because of its high yields, immunity from covered smut, and resistance to loose smut, Markton is recommended in preference to other varieties. The status of oats production in Utah is described, and the characteristics and yields of important varieties are recorded.

The Katahdin, Chippewa, and Golden potatoes, C. F. CLARK and F. J. STEVENSON (*U. S. Dept. Agr. Circ. 374 (1935), pp. 12, figs. 3*).—This is a revision of and supersedes Circular 276 (E. S. R., 70, p. 177). Additional data on the adaptation and performance of Katahdin and Chippewa potatoes are given, and the characteristics and performance of the Golden variety are set forth.

In several tests in Michigan, North Dakota, Oregon, and Idaho, Katahdin showed ability to produce a good crop of tubers of desirable shape under relatively adverse conditions. Indications were that it will partly replace standard varieties in certain sections of Michigan, Iowa, New Jersey, Oregon, northern Idaho, and the higher altitudes of Colorado. Reports from North Dakota, Minnesota, Michigan, Iowa, New Jersey, Florida, and Louisiana indicated that Chippewa has a wide range of adaptability. The Golden potato, a late-maturing yellow-fleshed variety, produces large yields of medium-sized, roundish tubers with rather shallow eyes and ranks high in cooking quality. Its adaptation seemed more limited than either of the other varieties, it being particularly adapted to northern Maine, where it significantly outyielded Green Mountain, Irish Cobbler, Rural New Yorker No. 2, Katahdin, and Chippewa for an average of 4 yr.

The total production of Katahdin in the United States probably exceeded 100,000 bu., of which 41,000 were certified. About 1,500 bu. of Chippewa and 1,000 bu. of Golden were available for the 1935 crop.

Length of exposure to light in relation to plant growth in rice, C. L. PAN (*Jour. Amer. Soc. Agron., 28 (1936), No. 1, pp. 58–63*).—When rice plants were subjected to normal and a 12-hr., a 9-hr., and a 6-hr. day, the day lengths being shortened by covering the plants with a black cloth, shortening the period of exposure to light decreased the number of culms per pot, increased plant height, and hastened the period of maturity. The latter effect was much greater with late-maturing varieties than with normally early-maturing rices.

Oil and protein studies of Oklahoma grown soy beans, J. E. WEBSTER and B. F. KURTZ (*Okla. Acad. Sci. Proc. [Okla. Univ.], 15 (1935), pp. 32–36*).—Analyses of 19 varieties of soybeans grown at the Oklahoma Experiment Station showed them to be low in oil and high in protein as compared with soybeans from other sections of the country. Very low iodine values for the oil were found, attaining approximately 108 for several varieties in certain years. In general, oil from soybeans grown at the station must be classed as semidrying. Soybeans from eastern Oklahoma were quite different in chemical composition than those grown at the station.

Environmental factors affecting seed setting in sugar beets, S. M. RALEIGH (*Jour. Amer. Soc. Agron., 28 (1936), No. 1, pp. 35–51*).—With the aim of obviating space isolation for selfing of sugar beets in breeding investigations, tent isolators and isolators of different types and sizes of parchment, kraft, and cellophane were placed on mother beets growing at the Minnesota Experiment Station and at Waseca and Castle Danger, Minn. Cutting back branches, leaving 10 to 30 glomerules per isolator, and opening the isolator after all flowers were pollinated resulted in satisfactory seed production. Much less seed was obtained when isolators were not opened after pollination. Branches isolated when only the ends were clipped produced little seed, and most branches were killed or the isolators broken. Kraft isolators, opened or unopened, were more satisfactory than parchment or cellophane for seed formation. Tent isolators were not as satisfactory as branch isolators, being accompanied by very small seeds, and high temperature and humidity within the tents resulted in weakening the plants placed therein. Early planted mother beets were more satisfactory than later plantings when branch isolators were used. They flowered when the temperature was cooler and produced many main branches from the crown. Glomerules produced on uncovered branches cut back were larger than those from similar branches not cut back, and cutting back the branches permitted removal of isolators after 2 or 3 weeks.

Methods of selecting sugarcane seedlings (as adopted at Coimbatore), T. S. VENKATRAMAN (*Agr. and Livestock in India, 5 (1935), No. 6, pp. 650–653, pls. 3*).—Important stages in the breeding work are reviewed, and features of the selection methods are outlined.

Studies of ripening of sugarcane in Louisiana and of effect of topping upon yields of cane and sugar per acre, G. ARCENEAUX (*U. S. Dept. Agr. Circ. 368 (1935), pp. 32, figs. 4*).—Results of studies at the U. S. Sugar Plant Field Station, Houma, La., during the harvesting seasons in 1932–33 and 1933–34 disclosed the existence of important varietal characteristics with respect to comparative rate of ripening and to relative concentration of sugar in different sections of the stalk at various dates throughout the harvesting season. Considerable gains in cane yield per acre and indicated yields of sugar per ton of cane usually are made by sugarcane between October 15 and the date at which progress in growth and ripening commonly is interrupted by freezing temperatures. The extent of gains in sugar in different varieties depends largely on their inherent maturing characteristics. Following temperatures below 32° F., the extent of the succeeding gains depends largely on the varietal reaction to low temperatures. The feasibility of discarding extensive portions of the upper part of the stalk of certain varieties, as Co. 281 and Co. 290, early in the season for the purpose of improving the quality of mill cane was evident. Examination of "stubs" remaining after harvest in accordance with usual plantation practice showed that sugar yields per acre could be increased materially by cutting the cane lower.

Tobacco growing in Canada, N. A. MACRAE (*Canada Dept. Agr. Bul. 176, n. ser. (1935), pp. 45, figs. 33*).—Practical information is given on types and varieties of tobacco suitable for Canada; areas and production; climate, soil, and fertilizers; plant beds and their management; cultural and harvesting practices suitable for the several types; seed production; curing and fermentation; preparation for market; and on plant diseases and insect pests affecting tobacco in Canada and their control.

The excessive smoke odor of open fire-cured Kentucky tobacco [trans. title], M. Benincasa (*Bol. Tec. R. Ist. Sper. Coltiv. Tabacchi, Scafati, 32 (1935), No. 3, pp. 209–217, figs. 4*).—Practices suggested to avoid excessive smoke odor include the use of ordinary nonresinous woods for smoke, all possible ventilation, leaving the tobacco hanging as long as possible after curing, and fermenting the tobacco before packing into hogsheads.

Factors influencing the fire-holding capacity of tobacco [trans. title], E. De Bonis (*Bol. Tec. R. Ist. Sper. Coltiv. Tabacchi, Scafati, 32 (1935), No. 3, pp. 219–226*).—In a study of the chemical composition of ash and the corresponding contents of organic acids of tobaccos with good and poor fire-holding capacities, calcium content of the ash appeared to favor fire-holding capacity. The calcium : magnesium ratio was found to be higher in good burning leaf and lower in leaf with poor burn.

Chlorine and fire-holding capacity in tobacco.—I, Distribution of chlorine in the Kentucky tobacco leaf [trans. title], A. Ceschin (*Bol. Tec. R. Ist. Sper. Coltiv. Tabacchi, Scafati, 32 (1935), No. 3, pp. 227–236, figs. 4*).—In the topped plant of Kentucky tobacco, chlorine was observed to decrease from the lower to the upper leaves. In the same leaf, regardless of its position, chlorine decreased from the base to the apex and from the primary vein to the margin. In the Kentucky leaf the center vein and branches were higher in chlorine than the leaf blade, and chlorine also decreased from the base to the apex.

Registration of standard wheat varieties, II, J. A. Clark (*Jour. Amer. Soc. Agron., 28 (1936), No. 1, pp. 64, 65*).—Supplementing an earlier note (E. S. R., 56, p. 433), this report lists 35 varieties of wheat approved for registration as standard varieties which had not been registered by the American Society of Agronomy since the publication of Classification of American Wheat Varieties (E. S. R., 49, p. 634).

Registration of improved wheat varieties, IX, J. A. Clark (*Jour. Amer. Soc. Agron., 28 (1936), No. 1, pp. 66–68*).—Varieties of wheat approved for registration (E. S. R., 72, p. 767) in 1935 included Hymar, derived from Hybrid 128 × Martin; Comet, derived from Marquis × Hard Federation; and Clarkan, developed from a natural Blackhull-soft wheat cross. Brief descriptions and records of performances are given.

Relief wheat, D. C. Tingey and R. W. Woodward (*Utah Sta. Bul. 264 (1935), pp. 12, fig. 1*).—Relief wheat, a new hard red winter wheat fairly resistant to most forms of covered smut occurring in Utah, is a selection from a Hussar × Turkey 26 cross made at the station. It resembles Turkey in appearance and the yield, quality, growth habit, and date of maturity are about the same as for Turkey or Utah Kanred. Besides its resistance to various forms of covered smut, which has caused heavy losses in central and northern Utah and southern Idaho, it also appears equal in all other respects, such as yield, winter hardiness, and quality, to the better wheat varieties currently being grown in the region.

Comparative yields of spring wheat varieties in Utah, D. C. Tingey and R. W. Woodward (*Utah Sta. Bul. 262 (1935), pp. 12, fig. 1*).—The comparative acre yields, 1926–34, for Dicklow and Federation spring wheats and for four strains of hybrid origin in station tests and in tests in various counties, 1931–33, made in cooperation with the U. S. Department of Agriculture, are reported with remarks on the status of the crop in Utah.

Dicklow and Federation averaged about equal in yield for all sections where tested. A pronounced differential response of varieties to different sections was evident, Dicklow outyielding Federation in Sanpete and Uintah Counties, whereas Federation apparently did much better in Box Elder and Millard Counties. In all other sections no difference in yields between the two varieties was apparent. Certain of the strains of hybrid origin yielded as much as Dicklow and Federation and appeared superior in strength of straw, uniformity, and quality.

The reaction of wheat varieties to different dates of sowing, J. B. Harrington and W. H. Horner (*Sci. Agr., 16 (1935), No. 3, pp. 127–134, figs. 2; Fr. abs., pp. 133, 134*).—Plantings of Marquis, Reward, Ceres, and Garnet spring wheats made at weekly intervals from April 15 to June 15, 1931–34, at the University of Saskatchewan, demonstrated that conditions favoring the growth of one variety may be much less favorable to another. Significant interactions between varieties and planting dates were found for both grain yield and plant height in nearly every year. In general, the moderately early Marquis did best when planted early in May, and the very early Reward yielded best when planted about a week afterward. Reward attained optimum height in plantings two weeks later than those giving the tallest Marquis. Indications were that comparative plat tests of leading wheat varieties, and probably of other cereals at different experimental stations, should be planted at several dates rather than at one date.

Some effects of time of harvest on the yield and quality of wheat, G. C. Brown (*Michigan Sta. Quart. Bul., 18 (1935), No. 2, pp. 89–91*).—When American Banner and Bald Rock wheats were harvested at several stages of development in July and August, 1931–33, in continuation of work begun by Wilsie (E. S. R., 64, p. 336), no significant yield losses occurred in the earlier stages of the combine-harvest period. Evidently either wheat might stand for at least three weeks after the normal binder-harvest stage without serious loss of yield unless severe hail or wind storms should occur. The moisture content of wheat might be expected to drop rapidly to about 14 percent, at which point it fluctuates with weather and atmospheric conditions. The test weight of the wheat was maintained until about the third week after normal binder-harvest time, after which it dropped significantly, due apparently to occasional dampening of kernels by rain or changes in atmospheric conditions. Delayed harvest did not result in changes in protein content, but flour from the later-harvested wheat produced slightly larger loaves than from that cut earlier. Delay in harvest apparently made for a stronger gluten. In combining these wheats it seems desirable to delay harvest until about one week after the grain is ready to cut with the binder. Equipment in relation to acreage should be adequate to complete harvesting within two weeks of this date.

The effect of potassium supply on the composition and quality of wheat, II, A. G. McCalla and E. K. Woodford (*Canad. Jour. Res., 13 (1935), No. 6, Sect. C, pp. 339–354, figs. 5*).—A repetition of earlier work (E. S. R., 72, p. 615), together with a study of the distribution of nitrogen and minerals in developing plants showed that limiting the potassium supply to wheat plants resulted in a lowered nitrogen content and markedly increased calcium and magnesium contents in the dry matter. It retarded growth, reduced the total quantity of individual nutrients absorbed per plant, and resulted in an increase in the proportion of grain to total yield. Gluten and baking tests revealed an adverse effect on the quality of the grain. Neither sodium nor calcium was effective in replacing potassium, although sodium was the better.

The influence of environment upon the germination of weed seeds, R. O. Bibbey (*Sci. Agr., 16 (1935), No. 3, pp. 141–150, figs. 3; Fr. abs., p. 150*).—Weed seed germination as affected by the relative dormancy of the seed, temperature, oxygen, and moisture was studied at the University of Saskatchewan. Seedlings of several common weeds emerged distinctly earlier in the spring than the earliest planted spring cereals, suggesting the need for destroying weeds in the spring before planting the crop. On the other hand, wild oats and redroot pigweed germinated later than the grains. Aeration of the soil by tillage was found to encourage the germination of weed seeds lying dormant in the soil. The covering of seeds by tillage in the fall encouraged the germination of wild oats and suppressed that of stinkweed, but did not influence germination of wild mustard seeds significantly. Moisture determinations showed that cultivation of the surface soil in hot dry weather hastened the drying-out of that soil enough to prevent germination of weed seeds. Therefore, unnecessary tillage such as the maintenance of mulch on clean summer fallow, and cultivation soon after rain favorable to weed seed germination, should be avoided.

Root development of weeds and crops in competition under dry farming, T. K. Pavlychenko and J. B. Harrington (*Sci. Agr., 16 (1935), No. 3, pp. 151–160; Fr. abs., p. 160*).—Recent weed research at the University of Saskatchewan has emphasized problems of plant competition, especially that involving weeds and crop plants (E. S. R., 70, p. 772). Studies dealing with competition in relation to the struggle for available moisture showed that competition begins under the soil surface when the root systems overlap in their quest for water and nutrients. It immediately manifests itself in retarded development of top growth, and becomes intensified by top growth competition for light only after shading of one plant by another occurs. Marquis wheat yielded 40 percent less in plats infested with wild mustard than in weed-free plats. Plants of barley, wheat, and wild oats grown alone in areas 10 ft. square attained about 10 times as large growth of root system and top as did plants grown in 6-in. drill rows. Plants of hares-ear-mustard, wild mustard, and Russian-thistle grown alone produced from 100 to 1,000 times the growth they made in ordinary 6-in. drills. In the dry year of 1933, single plants of Hannchen barley and Marquis wheat, grown in the center of a 10-ft. square each had a large vigorous seminal root system and a very extensive crown root system, whereas plants from 6-in. drill rows were much smaller and had practically no crown root system.

In a weed v. cereal competition study, Hannchen barley competed much more successfully with wild oats and wild mustard than did Marquis wheat. This is attributed to the fact that Hannchen after five days of emergence usually has more seminal roots, and 22 days after emergence it develops also more crown roots than Marquis. Marquis wheat competed fairly successfully with wild mustard, having a total root system 30 percent longer than mustard, but was badly depressed by wild oats, which had more than four times as large a total root length.

Relation between rate of seeding and yield of cereal crops in competition with weeds, G. L. Godel (*Sci. Agr., 16 (1935), No. 3, pp. 165–168*).—Its experiments throughout the Province on the problem of rates of seeding in weedy fields led the Saskatchewan Department of Agriculture to recommend early planting to obtain germination ahead of weeds, shallow planting for quick emergence, and fertilizing to provide rapid development of the crop. Heavier seeding is advised to accelerate the formation of a dense mat of cereal roots, so as to smother weeds more effectively, to avoid misses in the rows, and to hasten the shading of spaces between the rows. Tentative recommendations were for wheat 1¾ to 2¼ bu. per acre, barley 2 to 2½, and oats 2½ to 3 bu.

Sulfuric acid for control of weeds, W. E. BALL and O. C. FRENCH (*California Sta. Bul. 596 (1935), pp. 29, figs. 16*).—Experiments on field spraying for control of weeds in grain, studies of factors influencing the effectiveness of sulfuric acid as a weed spray, comparisons of wetting agents or spreaders, and the development of equipment for applying sulfuric acid (E. S. R., 73, p. 115), made in cooperation with the Crop Protection Institute and the California State Department of Agriculture, are reported with remarks on similar work elsewhere and on necessary precautions.

Sulfuric acid has been used for some time in controlling annual weeds, particularly mustard and wild radish in grain fields. In France, 500,000 acres of cereals were sprayed with sulfuric acid in 1933, and in England over 20,000 acres were sprayed in 1934. Approximately 50 percent of the 1,475,000 acres of small grain grown in California in 1935 was infested with weeds that may be controlled with sulfuric acid.

Although lack of suitable equipment for applying dilute sulfuric acid retarded its use as a herbicide in the United States, a successful sprayer has been developed in which the use of an ejector mixing device eliminates the necessity of having dilute acid in contact with a spray pump and of mixing the acid in open containers. Experimental results showed that about 95 percent of the mustard and wild radish in grain fields may be controlled with dilute sulfuric acid. Sprayed plats often produced 50 percent more grain than unsprayed plats. While the concentration of the acid and the volume of solution per acre may vary with climatic conditions, in general 10 percent acid by weight at the rate of 130 gal. per acre has given best results. Under the experimental conditions the total cost of an application has approximated $3 per acre.

HORTICULTURE

[Horticultural studies by the Bureau of Plant Industry] (*U. S. Dept. Agr., Bur. Plant Indus. Rpt., 1935, pp. 7, 8, 11, 12, 13–15, 18, 19*).—Brief reports are presented on the progress of the following investigations: The development of the devil's shoestring (*Cracca virginiana*) as a source of insecticides; tests of shelterbelt trees at Mandan, N. Dak.; means of controlling the set of apples by destroying the blooms with sprays in the full crop year; response of sweet cherries to pruning; thinning of date clusters as a means of influencing size, time of ripening, and grade of fruits; effect of plant spacing on the production of the Blakemore strawberry; day length effects on the strawberry; effect of defoliation and pruning on the set and filling of pecan nuts; moisture requirements of the Persian (English) walnut; precooling and transportation of oranges; use of sodium metaborate as an antiseptic for citrus fruits; desirable storage temperatures for grapefruit; storage temperatures for northwestern pears; packing of apples; removal of spray residues from currants; storage of shelled lima beans; control of puffiness in tomatoes; inheritance of red pigment in lettuce; breeding of lettuce for resistance to brown blight; standardization of onion varieties; proper maturity of manetti rose stocks at time of digging; development of goldenrod and other potential rubber-producing plants; classification of South American plants known as fish poisons and their possible use as insecticides; and the development of the Quetta nectarine.

[Horticultural studies by the Maryland Station] (*Maryland Sta. Rpts., 1934, pp. XI, XII, XIV, XXIV, XXV; 1935, pp. XXVI, XXVII, XXX–XXXII*).—Brief reports are presented on the results of electric sterilization of greenhouse soils, mushroom culture and temperature control in electric hotbeds, an electric fruit and vegetable drier, variety and breeding experiments with sweet corn, chromosome determinations in the genus *Ipomoea* and the genus *Gladiolus*, breeding of canning peas, girdling of apple trees as affecting fruiting behavior, fertilization of apple trees, peach pruning, removal of toxic residues from apples, fruit thinning of grapes, prevention of fruit cracking in the tomato, and the development of color in tomatoes and prepared tomato products.

Supplementary illumination from Mazda, mercury, and neon lamps on greenhouse plants, G. H. Poesch (*Ohio Sta. Bimo. Bul. 177 (1935), pp. 210–212, fig. 1*).—A comparison during the winter months of three types of supplementary light, namely, Mazda (two 225-w clear glass lamps), neon (450 w), and mercury vapor (450 m), all placed 3 ft. above and directly over the center of the benches and turned on from 5:30 p. m. to 9:30 p. m. showed in every case, except the Evening Star chrysanthemum, the Mazda lamps to be the most effective with respect to total flower production, capacity to hasten flowering, and increased stem length. The color of the foliage was somewhat paler under all artificial lights, but flower color was about the same in all plats, including daylight alone. In a test with *Calceolaria* begun December 19, 1934, the Mazda, neon, and mercury lamps hastened flowering 38, 20, and 15 days, respectively, over ordinary daylight.

Soil, field-crop, pasture, and vegetable-crop management for Erie County, New York.—III, Vegetable crops, F. O. Underwood (*[New York] Cornell Sta. Bul. 630 (1935), pp. 87–115, figs. 4*).—As a result of an intensive survey, information is presented on the general status of vegetable production, the relation of climate and soil to vegetable growing, varieties, fertilizer and fertilizing practices, and specific information with reference to the culture of potatoes, cauliflower, cucumbers, market and canning peas, tomatoes, snap beans, and sweet corn.

***Substitution of commercial fertilizers for manure in vegetable production,** J. W. Lloyd and E. P. Lewis (*Illinois Sta. Bul. 421 (1935), pp. 577–610, figs. 16*).—Supplementing an earlier report (E. S. R., 67, p. 36) with additional information, the authors discuss the results of 8 yr. of fertilizer experiments with 10 vegetable crops. Commercial fertilizers were found capable of replacing to a large extent the stable manure formerly used extensively but now more or less prohibited by high cost. With half the manure replaced by commercial fertilizer, yields were higher than with manure alone. The lesser yields obtained with commercial materials alone than with manure alone were generally more economical. In the absence of stable manure complete fertilizers were more effective than incomplete materials, but when 10 tons of manure were applied per acre, superphosphate was, with most of the crops, fully as effective as complete fertilizer and resulted in more economical yields. Nitrogen alone was not a profitable treatment but when applied with phosphorus showed good results. Limestone applications resulted in slight increases with most of the crops.

Anatomy of the seedling of Asparagus Officinalis, N. Mullendore (*Bot. Gaz., 97 (1935), No. 2, pp. 356–375, figs. 44*).—The results are presented of a study of the structure of the embryo and the development of the seedling.

Some experiments in asparagus cultivation, A. N. Rawes (*Jour. Roy. Hort. Soc., 60 (1935), No. 10, pp. 452, 453*).—At the Royal Horticultural Society Garden, Wisley, England, records taken during the first three cutting seasons on male and female Connover Colossal asparagus plants set in alternate beds showed great differences in yield between sexes. In one series of beds, 64 plants each, the three beds of male plants yielded a total of 9,800 marketable spears as compared with 5,611 from the female plants. No appreciable differences were observed in the size of individual spears from the two lots.

Preliminary observations on spacing indicated that there is an optimum distance, but it is deemed too early to draw final conclusions.

Some factors affecting color in carrots, J. C. MILLER, F. D. COCHRAN, and O. B. GARRISON (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 583–586*).—At the Louisiana Experiment Station, Danvers Half Long carrots planted on raised beds at three different seasons, October, January, and August, were given different fertilizer treatments in an attempt to influence the color of the crop. None of 23 different fertilizer treatments, which included some of the so-called rare elements, had any constant or significant influence on color. In a strain test, which included 8 varieties, it was found that all kinds were about equally subject to off color. Scarlet Horn and Nantes were slightly better colored than the rest, and a variation as large as 6 percent occurred among Danvers strains. Spring-sown carrots contained a much higher percentage of well-colored roots than did the autumn or winter crops. In tests on several soils it was found that soil reaction had no significant influence on color, but that aeration and organic matter did appear to be favorable factors. The beneficial effect of aeration was manifested also in the fact that better colored roots were obtained with high than low beds. Roots which developed good color irrespective of adverse conditions were saved for propagation, and observations on the next generation showed a marked increase in well-colored roots. Since selfing resulted in a reduction in vigor and open pollination gave almost as good results, the latter appeared more desirable.

Cellophane and waxed paper wrappers for storing cucumbers, L. R. HAWTHORN (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 578–582, figs. 3*).—Of several kinds of wrappers tested at the Winter Haven Substation of the Texas Experiment Station for protecting cucumbers held at high room temperatures, moisture-proof cellophane was most effective in retarding weight losses, with waxed paper nearly as good. There was a tendency for all fruits to lose weight more rapidly as time elapsed. When records were taken at the time the fruits had lost 10 percent of their weights, variation in losses was less than when the tests were carried to a 15-percent loss. Quality tests based on taste indicated that cucumbers stored for more than 20 days became unpalatable irrespective of treatment. The condensation of water within the moisture-proof wrappers increased losses from decay. A preliminary test indicated that the length of storage of wrapped cucumbers can be considerably increased by refrigeration.

Some soil conditions affecting lettuce seed germination, R. C. THOMPSON (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 572–577*).—Noting a much better germination in lettuce seed in sandy loam than in a compost of muck, loam, and manure soil, the author compared muck from Indiana, screened river sand, medium loam from Virginia, and a mixture of Indiana muck, loam, and a small amount of manure. Emergence records made on the tenth day after planting showed uniformly best results with muck, with river sand slightly inferior. Observing much greater differences among flats of a single soil type in the case of composted soil and loam than in muck or sand, he ran a second series with Indiana muck and muck compost in which different methods of watering were used and part of the seed was soaked for 3 hr. in tap water before planting. Significant results in germination occurred only in the muck compost. From results with subirrigation and surface watering, he concludes that puddling of the surface in the case of surface watering retarded the oxygen supply to the seed, and as a result suggests that in soils with a tendency to puddle lettuce seed be planted after rather than before rains.

Wave lengths of radiation in the visible spectrum inhibiting the germination of light-sensitive lettuce seed, L. H. FLINT and E. C. MCALISTER (*Smithsn. Misc. Collect., 94 (1935), No. 5, pp. 11, figs. 5*).—In this joint study by the Smithsonian Institution and the U. S. Department of Agriculture there was discovered in the spectrum a band in the region of 7,600 a. u. which inhibited the germination of light-sensitive lettuce seed far more effectively at the energies characterizing both solar and Mazda radiation than did wave lengths in the region 4,200 to 5,200 a. u. as previously reported (E. S. R., 71, p. 774). An analysis of germination response in the region 4,200 to 5,200 a. u. showed two maxima of inhibition in the violet, blue, and green regions, with a major one at 4,400 a. u. and a somewhat subordinate one at 4,800 a. u. A singular agreement was observed between the two maxima and those established for the phototropic response of etiolated coleoptiles of oats when exposed to the same wave lengths.

Correlation of shape of fruits, cotyledons, and seeds in melons, L. M. WEETMAN (*Bot. Gaz., 97 (1935), No. 2, pp. 388–398, figs. 8*).—In this study by the Iowa Experiment Station it was found that the shape of the cotyledons was significantly and positively correlated with the shape of fruits in the watermelon, but there was no significance in the case of citrons or of citron-watermelon hybrids. In 28 varieties of watermelons the mean shape indexes of seeds were significantly correlated with mean shape indexes of the cotyledons and with mean shape indexes of the fruits. A significant change in shape of watermelon cotyledons occurred as the seedlings developed, the relative length increasing more rapidly than width. Cotyledon shape was found to be significantly correlated with fruit shape in a small group of cantaloup plants. In the watermelon greater accuracy was obtained in forecasting the mean shape of fruits of a variety or selection than of an individual plant.

Comparison of some methods of growing onions, C. C. STARRING (*Montana Sta. Bul. 305 (1935), pp. 11, fig. 1*).—Greenhouse-produced transplants were found distinctly superior to field-sown onions of the same variety in yield, maturity, and keeping quality. Transplants grown at low temperatures (minimum 43° to 50° F.) were superior to those grown at higher temperatures (minimum 60° to 70°). Comparing 1.5- and 3-in. depths for setting transplants, it was found that depth had a material influence on shape, amount of doubling, and yield. The shallow-planted onions produced more doubles and flat bulbs, but in general gave larger yields of marketable onions. Sets of the Ebenezer variety were superior to field seedings for producing a late summer crop, but field seedings gave better onions for winter storage. The rolling of tops and the cutting of roots proved of no value.

Effect of size of sets on yield and on the production of doubles in onions, H. C. THOMPSON (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 558–560*).—At Cornell University sets of Ebenezer, Yellow Globe, and Red Wethersfield onions after winter storage at 30°, 32°, 40°, and 50° F. and common storage (60° to 70°) temperatures were graded into three sizes prior to planting. The maximum yields were obtained in all cases from the 30° lots, but sets held in common storage produced larger yields than those held at either 40° or 50°. There was less premature seed stalk formation in the 60° to 70° lot than at either 40° or 50°, and in the largest sets this fact is conceded a factor in the yield differences. In the medium and small sets there was no appreciable difference in seed stalk formation between the upper three temperatures. In common storage many of the smaller sets were so badly shriveled as to be worthless for planting. Based on a composite average of all storage temperatures, large sets produced an average of 20.79 percent, medium 1.36 percent, and small sets no double onions. There was some difference between varieties and also some variation from season to season. Apparently the larger content of stored foods in larger sets was a factor in doubling. Eliminating those sets which formed seed stalks, it was found that the percentage of doubles was smaller in sets stored at 30° than in similar sets stored at 40° or 50°.

The effects of certain salts on the growth of onions, J. E. Knott (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 561–563*).—In experiments at Cornell University in which Ebenezer and Red Wethersfield onions were grown in containers filled with muck soil which was known to have produced poorly colored onions, applications of sulfate salts of copper, zinc, cobalt, and nickel at the rate of 300 lb. per acre, in addition to 1,000 lb. of commercial fertilizer, failed to exert profound effects upon the average weight of the bulbs. Zinc sulfate exerted a harmful influence in the first of three crops grown, and copper tended to increase size in the first two crops, but significantly in the second only, and in this case the author believes that late planting and high temperature in the greenhouse may have been involved. The copper sulfate treatment did not increase the size of Red Wethersfield bulbs significantly in any trial. Copper sulfate increased the thickness of the first complete dry scale in every case and in Red Wethersfield induced a somewhat darker purple color. Since the other sulfates did not influence scale thickness, the author believes that it is the copper and not the sulfate that is concerned. In field experiments copper sulfate caused firmer bulbs with thicker and better colored scales. Yields were somewhat larger, but in only one instance approached significance.

Morphology of an internal type of abnormality in the fruit of the pepper, H. L. Cochran (*Bot. Gaz., 97 (1935), No. 2, pp. 408–415, figs. 14*).—At Cornell University anatomical studies of fruits selected at various stages of development from pepper plants growing in the greenhouse showed that internal abnormality is hypodermal in origin, being initiated in the outermost layer of cells of the placenta when the pepper bud is still very small. The young abnormality was distinguished early in its ontogeny by a group of undifferentiated, lightly staining cells which at first divided very rapidly. The abnormality was highly variable in shape, some containing styles and others none. Most of the ovules borne in the abnormality aborted, with the survivors typically anatropous. None of the affected ovules developed beyond the two-celled embryo sac stage.

A study of the temperature, day length, and development interrelationships of spinach varieties in the field, V. R. Boswell (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 549–557*).—An analysis is presented by the U. S. Department of Agriculture of data on time of planting, emergence of plants, and appearance of seed stalks on 17 crops of 7 varieties of spinach grown over a wide area, including Maryland, Virginia, California, Texas, and New York. Since season of production exerted such a profound effect on the time required for spinach to reach marketable size, the data on the 8 spring and 9 fall or winter crops are grouped separately. Although length of growing period varied widely from year to year and with location, the relative long-standing tendency was very evidently a varietal characteristic. It was evident that the time of seed stalk appearance was related to an accumulation of a more or less definite amount of effective heat units. For the varieties Virginia Savoy, Bloomsdale Savoy, and Viroflay no temperature summation for the long-day season exceeded the minimum summation for the short-day season, but in Gaudry, Princess Juliana, and King of Denmark there were seven exceptional instances. A poor correlation was noted between time of seed stalk appearance, temperature, and day length among the several spring crops, with more definite relations in the winter crops. It was clear that certain factors other than day length and total heat influenced the termination of vegetative development in the spinach, and the author suggests that soil and cultural conditions may possibly play a part.

Injurious effects of certain nitrogenous fertilizers on the growth of spinach, M. M. Parker (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 546–548*).—At the Virginia Truck Experiment Station on soils typical of those used in spinach production, four different sources of nitrogen, namely, ammonium sulfate, nitrate of soda, dried blood, and cyanamide, applied in connection with phosphorus and potash and turned under green manures were studied in their effects on spinach. In the crop planted August 30 and harvested December 1, 1934, the yields for sulfate of ammonia alone, sulfate of ammonia plus nitrate of soda, sulfate of ammonia plus blood, blood alone, and cyanamide alone were 5,141, 6,824, 5,823, 5,664, and 6,873 lb., respectively, per acre. With all plats registering an initial pH of 5.2, the final readings December 10 were 4.9, 5.6, 5.2, 5.6, and 5.5, respectively. In a second planting made September 12 on a soil with an initial pH of 5.9, the results were even more striking, the yields being 1,319, 5,404, 4,415, 5,359, and 6,238 lb., and the final pH values 4.5, 5.8, 5, 5.4, and 5.9. The low yield on the sulfate of ammonia plat was associated with killing of the young plants by the very low soil reaction. Pronounced effects were also noted on the color and habit of growth of spinach on the respective plats.

Inspection and certification of nurseries in Kentucky, with a brief report for the year ended June 1, 1935, W. A. Price and H. G. Tilson (*Kentucky Sta. Regulat. Ser. Bul. 8 (1935), pp. 11*).—Listing the nurseries inspected and certified in the 1934–35 season, the authors present an inventory of plant materials present and of insect and plant diseases found.

Progress report on fruit breeding, G. T. Spinks (*Univ. Bristol, Agr. and Hort. Res. Sta., Long Ashton, Ann. Rpt., 1934 pp. 24–28*).—Following the usual procedure (E. S. R., 71, p. 639), brief mention is made of developments in the breeding of apples, pears, plums, and small fruits at the Long Ashton Research Station.

Some results of mineral deficiency studies, J. R. vanHaarlem (*Canad. Hort. and Home Mag., 59 (1936), No. 1, pp. 6–8, figs. 5*).—With the aid of illustrations the deficiency symptoms in fruit plants resulting from the lack of various available nutrients are described and discussed. In the Niagara fruit district as a rule deficiencies were encountered chiefly on light sandy soils otherwise favorable for peaches and cherries. At the Vineland Experiment Station applications of nitrate of soda, superphosphate, sulfate of potash, and stable manure used singly or in combination to peach trees which had shown serious deficiency troubles the preceding year indicated that manure is the most favorable corrective fertilizer of all. The combination of phosphate and potash was effective until late fall, when slight symptoms of deficiency became evident. A combination of cover crops, mineral fertilizers, and stable manure was observed to be giving good results in commercial orchards.

Some physiological studies with calcium cyanamide and certain of its decomposition products, R. M. Smock (*Ohio Sta. Bul. 555 (1935), pp. 46, figs. 14*).—Stating that cyanamide has come into rather general use in Ohio and is giving satisfactory results with all tree fruits, the author discusses the chemistry of cyanamide and its probable behavior in the soil and presents the results of experiments with apples, peaches, and tomatoes.

On the second to fifth day following cyanamide applications, the ammonium content of the roots of both tomatoes and peaches in soil cultures showed an increase, with the variations in date related apparently to the amount of colloidal or organic material in the growing medium. There was noted a persistence of this increase for 15 to 25 days following the applications. Nitrates increased in the roots of tomatoes and peaches a day or more following the ammonium increase. The author believes it unlikely that urea serves as a direct source of nitrogen for cyanamide-treated plants in soil cultures. Since macrochemical studies indicated that cyanamide-treated tomatoes had more ammonium and total soluble and nitrate ammonium free soluble nitrogen than did untreated plants, it is believed that the utilisation of cyanamide nitrogen is essentially an ammonium and nitrate phenomenon.

The effects of various concentrations of hydrogen cyanamide, dicyandiamide, guanidine, and guanylurea on the peach, apple, and tomato are discussed. In all three species the effects of hydrogen cyanamide and dicyandiamide differed in both root and foliage characteristics. Hydrogen cyanamide is said to be a potential source of injury when the cyanamide applications are too large or improperly made or applied to highly alkaline soils. Guanidine and guanylurea are believed unlikely sources of difficulty when cyanamide is applied to soil. Cyanamide-treated peach and apple trees made their greatest growth at pH 7.5 and 7, respectively. Tentative conclusions from the 3 years' orchard experiments in different sections of Ohio indicated that cyanamide is a satisfactory fertilizing material for apples when properly used.

Factors influencing the cooling of packages of fruit, S. W. DECKER (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 153–156*).—With the aid of thermocouples arranged systematically throughout the package, temperature differentials were determined by the University of Illinois within baskets of fruit held in a chamber approximating the temperature of the refrigerator car. In the early stages of cooling relatively large temperature differences were found between the outer and inner rows of fruit. Using apples of different sizes, it was found that the size of fruit is not an important factor in the rate of cooling. The use of ventilated containers decreased the temperature differential between that within and without the package. Air velocities below 120 ft. per minute had no influence on the rate of cooling of the contents, provided the temperature of the circulated air was constant. A drop of 12° F. in the internal temperature of apples followed immersion in water of a temperature between 51° and 52°, thus showing that cool water is much more effective in cooling fruit than is air of considerably lower temperature.

Soil moisture and irrigation investigations in eastern apple orchards, J. R. MAGNESS, E. S. DEGMAN, and J. R. FURR (*U. S. Dept. Agr., Tech. Bul. 491 (1935), pp. 36, figs. 12*).—During the four seasons 1930–33, in which the relation of soil moisture conditions to tree response was studied in irrigated and nonirrigated plats in apple orchards in western Maryland, there was noted at some time during each season reduced fruit growth rate due to a shortage of soil moisture, despite the fact that in three of the years the total rainfall from May 1 to October 31 was above normal. Under favorable conditions the growth of apple fruits measured on a volume basis proceeded at very nearly a uniform rate from a period some 6 to 8 weeks following bloom until near harvest time. In most cases the growth rate of fruit of trees growing in moderate-textured silt loam or silt clay soils was not measurably reduced until at least the driest part of the root zone approached the wilting percentage. In the case of moderate droughts causing no serious loss of foliage, growth of fruit was resumed at an apparently normal rate upon the restoration of moisture, but the ultimate size of the apples was reduced in proportion to the length and duration of the droughts.

Irrigation, by stimulating size, increased the yield of Rome Beauty trees more than 50 per cent but was of little benefit in the case of Oldenburg, an early summer variety. With relation to color development, a shortage of soil moisture resulted in dull, lifeless appearance, moderate moisture promoted maximum color, and excess moisture tended to reduce color. Fruit bud formation was apparently increased by early season moisture shortages, but after late July there was no apparent effect. The earlier closing of the stomata each day forecast moisture shortage prior to actual reduction in the growth rate of fruits. Although total carbohydrates in the tree were less under conditions of insufficient moisture, the sugar content of the bark and wood was markedly higher following periods of serious moisture shortage. Starch on the other hand was much lower in trees lacking adequate moisture. The effects of soil management practices on soil moisture and the value of irrigation in eastern orchards are discussed.

The "thin wood" method of pruning bearing apple trees, G. L. Ricks and H. P. Gaston (*Michigan Sta. Spec. Bul. 265 (1935), pp. 45, figs. 24*).—Beginning with a comprehensive review and analysis of the literature on pruning deciduous fruit trees, the authors discuss the results of investigations in which it was found that in the average bearing apple tree 49 percent of the crop is produced by the top, 36 percent by the outside, and 15 percent by the inside of the tree. Harvest records were taken on 8 trees each of 11 varieties. Because of the greater proportion of high-grade fruits in the top and outside of the tree the percentage division of monetary returns were 60, 33, and 7 percent, respectively. The size and number of fruits tended to be directly proportional to the diameter of the branch upon which they were produced. The amount and intensity of color of the apples tended also to be proportional to the diameter of the branch. In the case of Wealthy branches the character of the growth, as indicated by terminal development, was related to diameter, branches of large diameter growing practically three times as fast as thin branches.

Pruning investigations with 7 varieties 13 to 43 yr. of age indicated that thin wood pruning results in (1) decreased yield of inferior apples, (2) increased average size, (3) improved color, (4) increased returns, (5) saving in time and cost of pruning, (6) easier and more effective spraying, (7) easier and less costly fruit thinning and harvesting, (8) reduction in sun scald, (9) fewer water sprouts and consequently less fire blight, (19) less disturbance of bearing habit, (11) fewer pickings, and (12) a decreased frost hazard. The thin wood pruning system is said to be adaptable to trees of all bearing ages. The procedure followed in the pruning is outlined.

Studies on maturity of fruit, IV–VI, J. C. Hinton (*Univ. Bristol, Agr. and Hort. Res. Sta., Long Ashton, Ann. Rpt., 1934, pp. 29–108, pls. 5, figs. 56*).—Continuing the series (E. S. R., 68, p. 193), the author presents three papers.

IV. *The catalase and oxidase activity of apples in storage as affected by conditions obtaining during growth* (pp. 29–52).—Catalase activity of stored apples increased during storage, but in three instances subsequently declined during the later stages. The stage of maturity at time of picking and cultural treatments influenced catalase activity. Low activity observed in one sample was thought to be associated with unusually low temperatures prevailing some days prior to picking.

V. *The effect of conditions during growth on the progress of softening and on the loss of total weight in apples during storage* (pp. 53–88).—The results are discussed of pressure determination on apples from trees receiving different treatments. In general apples from trees in sod, bark ringed, or fruit thinned ripened less rapidly during the final period on the tree than did fruit on trees under clean cultivation. Losses in total weight during storage were also related to the treatment of the tree and led to the suggestion that the main factor governing loss of total weight is biological in nature and that loss of weight is a function of the metabolism.

VI. *The effect of conditions during growth on some chemical constituents of apples in storage* (pp. 84–108).—A loss of total nitrogen was noted during storage, with the rate of decrease influenced by the stage of maturity at harvest. The acid-hydrolyzable fraction decreased markedly during storage but in many cases showed an increase toward the end of storage life. The curve for the loss of sucrose during storage was found to be exponential in nature in the majority of the samples. The decline in sucrose apparently ceased at a time when there was still a residual amount present. The rate of increase in reducing sugars in storage was found to decrease with succeeding pickings, and the ratio of reducing sugar to sucrose increased during storage in all cases.

Apple investigations in Tasmania: Miscellaneous notes, W. M. Carne and D. Martin (*Jour. Council Sci. and Indus. Res.* [*Aust.*], *8* (*1935*), *No. 4, pp. 271–276*).—The results of experiments with apples stored at 32° and 34° F. in atmospheres containing different concentrations of respired carbon dioxide showed some injury at 32° with concentrations as low as 3 percent. Of three varieties, French crab, Sturmer, and Jonathan, the first was most and the last least susceptible to injury. In general, concentrations of 2 to 3 percent gave better results at the end of 8 weeks of storage than did lower or higher concentrations. The authors suggest that 2 percent of carbon dioxide is desirable for apples held at 32° for periods comparable to those required for overseas shipments.

Breakdown in Tasmanian apples, W. M. Carne and D. Martin (*Jour. Council Sci. and Indus. Res.* [*Aust.*], *8* (*1935*), *No. 4, pp. 265–270*).—From an investigation of nonparasitic wastage in Tasmanian apples, the authors conclude that liability to all forms of storage break-down varies inversely with the size of crop on individual trees grown under similar conditions. For example, in alternately bearing trees the on crop was much less susceptible to injury than the off crop, with medium crops intermediate. Liability to low temperature break-down was greatest in seasons of relatively low summer temperatures. In a single tree liability to break-down increased with maturity at time of picking and was greater in large than in small fruits. Marked differences were observed in varieties, and resistant kinds were characterized by a relatively low level of titratable acidity.

Photoperiod studies.—II, The vegetative growth of various grapes [trans. title], J. Hackbarth and W. Scherz (*Züchter*, *7* (*1935*), *No. 12, pp. 305–321, figs. 22*).—Experiments at the Kaiser Wilhelm Institute, Müncheberg, with European, American, and European×American types of grapes indicated that American types may be classified as short day plants and the Europeans as neutral in their response. The intermediate response of the hybrids suggested an inheritance of the response factors. With short day lengths all plants under study showed a lessened vegetative growth, strong root formation, better ripening of the wood, and an earlier abscission of the leaves. Shortening the day to 12 hr. caused changes in the shape of the leaves.

New citrus varieties for trial, H. B. Frost (*Calif. Citrogr.*, *21* (*1935*), *No. 1, p. 16, fig. 1*).—Brief descriptions are presented by the Citrus Experiment Station, Riverside, Calif., of four new citrus fruits, namely, Trovita orange and Kara, Kinnow, and Wilking mandarins, all of which were originated by the station.

Granulation of Valencia oranges, E. T. Bartholomew, W. B. Sinclair, and E. C. Raby (*Calif. Citrogr., 21 (1935), No. 1, pp. 5, 30, fig. 1*).—A summary is presented of the results of studies at the Citrus Experiment Station, Riverside, Calif., on the causes and control of granulation in the Valencia orange. Among factors related to the condition were time of harvesting, rate of growth of fruits, individuality of the trees, and the amount of water applied in irrigations. Although it was impossible to obtain much juice from badly granulated juice sacs by ordinary extraction methods, there was actually more water present, particularly in the early stages, than in normal tissues. The granulated sacs contained only about one-half as much sugar but approximately as much pentose and pentosan as did healthy sacs. In one season an unusual amount of granulation was observed in the center and stylar portions of affected fruits, even when little or none occurred at the stem end.

Pecan budding (*Mississippi Sta. Circ. 97 (1935), p. 1, fig. 1*).—This leaflet contains practical information.

Pecan bark grafting (*Mississippi Sta. Circ.* [98] (*1935*), *p. 1, fig. 1*).—This is a presentation of practical information for the grower.

Clematis, the large and small flowered: Their cultivation in the open air, including a comprehensive list of species and varieties, E. Markham (*London: Country Life Ltd.; New York: Charles Scribner's Sons, 1935, pp. 116, pls. 23*).—This includes general information.

Dahlia variety test, 1935, W. D. Armstrong, H. L. Cochran, and D. D. Long (*Georgia Sta. Circ. 105 (1935), pp. 8, fig. 1*).—Preceded by brief notes on cultural requirements, information is presented on a large number of dahlia varieties tested by the station.

Effects of light and temperature on iris of known heredity, A. E. Waller (*Amer. Iris Soc. Bul. 59 (1935), pp. 6–15, figs. 8*).—When clons of dwarf, intermediate, and tall varieties of iris were exposed, at the Ohio State University, to increased day lengths and increased temperature, they all bloomed in the same order as in the garden, but when plants were supplied increased heat without additional daylight or with increased daylight subsequent to the heat treatment they did not respond in accordance with the garden behavior. The author concludes, therefore, that both heredity and environment are involved in the response of iris to seasonal changes.

Our native phloxes and their horticultural derivatives, E. T. Wherry (*Natl. Hort. Mag., 14 (1935), No. 3, pp. 209–231, figs. 15*).—Stating that the genus *Phlox* comprises about 50 species, all natives of North America (although one extends from Alaska into Siberia), the author presents a classification of the different forms, with descriptive information.

Rock garden plants, C. Elliott (*New York: Longmans, Green & Co.; London: Edward Arnold & Co., 1935, pp. 328, pls. 17*).—Arranged alphabetically by botanical names, information is presented on characteristics and culture.

FORESTRY

Report of the Chief of the Forest Service, 1935, F. A. Silcox (*U. S. Dept. Agr., Forest Serv. Rpt., 1935, pp. 55*).—In the usual manner (E. S. R., 72, p. 628) this administrative report presents information on national forest policies, management of the national forests, research progress in the fields of forest economics, forest management, forest products, range management, and erosion stream-flow control, etc.

Forestry and economic recovery (*U. S. Dept. Agr., Sec. Agr. Rpt., 1935, pp.* [illegible]).—Under this title there is presented a brief discussion of such topics as the present condition of the forests of the United States, the effective emergency work of the Civilian Conservation Corps and other agencies in the forests, and the importance of forests as source of forage for livestock.

A preliminary survey of important factors which affect tree development in western Oklahoma, H. J. Harper (*Okla. Acad. Sci. Proc.* [*Okla. Univ.*], *15* (*1935*), *pp. 73–77*).—Studies by the Oklahoma Experiment Station of the soils in certain western Oklahoma counties indicated that in many cases the pH reaction is too alkaline for the favorable growth of trees and shrubs. Soils of recent alluvial deposit were satisfactory but of too high agricultural value to be utilized for forestry. On soils originating from old outwash sands from the Rocky Mountains, black locust made good growth where the percentage of fine and very fine sand was high, and an excellent correlation was established between the percentage of such sands and growth. Honeylocust made better growth on coarse sandy soils than did black locust or catalpa. Cottonwood made excellent growth when the percentage of fine sand was higher than 50 percent and the content of clay was low. The author believes that the effect of alkalinity is not as important as soil texture in the case of black and honeylocust, cottonwood, and bois d'arc.

A simple, accurate method of computing basal area of forest stands, C. A. Bickford (*Jour. Agr. Res.* [*U. S.*], *51* (*1935*), *No. 5, pp. 425–433*).—Stating that the common methods of obtaining the sum, the mean, the diameter of mean basal area, the standard deviation, the product moment, the mean growth, and other commonly sought statistics of basal area are either exceedingly laborious or introduce systematic errors, the author presents a formula method derived from the analytical definition of basal area, $b=\frac{\pi d^2}{(4)(144)}$, where b is basal area in square feet and d is the diameter in inches. In summation he asserts that statistics of basal area may be readily obtained by the formula method without using a basal area table, but advises that no one method will meet all situations and that the best treatment for each case will depend on the precision required, the size of the sample, and the mechanical aids available. For very small samples, when only simple statistics such as the sum and mean are needed, the basal-area table is said to be the easiest way of obtaining them.

Forest mensuration, D. Bruce and F. X. Schumacher (*New York and London: McGraw-Hill Book Co., 1935, pp. XIV+360, figs. 102*).—In this text for the forestry student and forester the subject has been approached largely from the graphical and statistical viewpoint.

DISEASES OF PLANTS

Crop losses from plant diseases in the United States, 1934, compiled by J. I. Wood (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1935, Sup. 89, pp. 45, figs. 24*).—The estimates of crop losses for 1934 have been computed and are presented in the same way as in previous years. Besides the tables showing reductions in yield for 1934, there is a graphic summary of losses during the 10 yr. from 1925 to 1934, the crop plants selected being those with sufficient data for comparison and showing variation from year to year. In addition to the yearly fluctuations in losses, the graphs show the averages for the two overlapping 10-yr. periods 1920–29 and 1925–34.

The Plant Disease Reporter, December 15, 1935 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 19* (*1935*), *No. 20, pp. 306–314*).—The following are among the items included:

The South American leaf disease of Para rubber invades Central America (as shown by specimens from Costa Rica heavily infected with *Dothidella ulei*), by J. A. Stevenson; some leaf and twig diseases of hemlock in North Carolina, by G. H. Hepting and R. W. Davidson; dead arm disease (*Cryptosporella viticola*) of grapes in California, by W. B. Hewitt; overwintering of *Phytophthora infestans* in tomato fields (evidence of overwintering in crop refuse being presented), by O. C. Boyd; *Septoria* on chrysanthemum (reported in New Jersey and the District of Columbia); a flower spot of *Helleborus niger* (isolations usually yielding a *Gloeosporium*), by R. P. White; and some diseases of ornamental and miscellaneous plants (including *Mentha piperita* infected with *Verticillium dahliae*, leaf injury to *Dracaena fragrans* due probably to a *Gloeosporium*, *Sclerotium rolfsii* on blighted partridgeberry, and blight of California privet due to *Glomerella cingulata*), by T. B. Post.

[Plant disease studies by the Bureau of Plant Industry] (*U. S. Dept. Agr., Bur. Plant Indus. Rpt., 1935, pp. 3, 6, 7, 10, 11, 12, 15, 16, 17, 23–25*).—Data are reported on the overwintering of *Aplanobacter stewarti* in adults of the flea beetle, *Chaetocnema pulicaria;* studies of the cotton root rot fungus; downy mildew of hops in California and attempts to develop resistant varieties; chestnut blight on the Pacific coast; *Coryneum* canker of cypress in California; the Dutch elm disease; *Phytophthora parasitica* causing a wilt of black locust seedlings; the decay hazard in sprout oaks; the control of cranberry fruit rots and of the leafhopper vector of false blossom; the breeding of new potato varieties, with special reference to disease resistance; a new copper phosphate fungicide for orchard and small fruits; plant parasitic nematodes; the biology of the sugarcane red rot fungus (*Colletotrichum falcatum*); the inheritance of disease resistance in sugarcane; a corn-sugar beet rotation as influencing stand and yield and sanitation; inbred lines and synthetic varieties of sugar beets selected for resistance to leaf spot and curly top; the factors inducing tobacco leaf spot epidemics; breeding tobacco for disease resistance; and boron deficiency in tobacco.

[Plant pathology at the Maryland Station] (*Maryland Sta. Rpts. 1934, pp. XXIII, XXIV, XXV; 1935, pp. XXVII, XXVIII*).—Studies are briefly summarised in the 1934 report on the physiology of resistance and susceptibility of tomatoes to *Fusarium* wilt, and the pathogenesis of *Septoria* leaf spot in tomatoes, the latter by F. Simonds; and in the 1935 report on the peach stone fungus; the strawberry root disease; potato spraying experiments; potato seed maintenance and indexing; mosaic-immune potatoes; the control of stem rot and pox in sweetpotatoes; and spraying apples for scab.

[Papers presented at the 1935 annual meeting of the southern division of The American Phytopathological Society, Atlanta, Ga., January 31 to February 1, 1935] (*Phytopathology, 25 (1935), No. 10, pp. 965–976*).—Abstracts of the following papers are given: A *Rhizoctonia* Bud Rot of Strawberry, by A. N. Brooks (pp. 965, 966); *Sclerotium rolfsii* Sacc. on Strawberries and the Effect of Certain Chemicals on the Sclerotia, by R. E. Nolan (p. 966); A Bark Disease of Tahiti Lime Trees Caused by *Phomopsis citri* Fawcett and *Diplodia natalensis* Evans, by W. B. Tisdale (pp. 966, 967); Anthracnose Disease of Eggplants, by T. D. Persons (p. 967); Only Certain Strains of Tobacco Mosaic Cause Mosaic Burn, by W. D. Valleau and E. M. Johnson (p. 967); Further Studies on the Effect of Ammonia Nitrogen on Growth of the Cotton-Root-Rot Fungus, *Phymatotrichum omnivorum*, in Field and Laboratory Experiments, by D. C. Neal (pp. 967, 968); Control of Diseases of Tomato Seedlings, by F. Van Haltern (p. 968); Do Necrotic Lesions Result in Localization of Tobacco-Mosaic Viruses in *Nicotiana?* by W. D. Valleau (p. 968); The Etiology of Damping Off of Cotton Seedlings, by C. H. Arndt (pp. 968, 969); Control of Potash Hunger and *Fusarium* Wilt in Cotton, by V. H. Young, J. O. Ware, and

O. A. Pope (p. 969); Seeds of Watermelons and Okra as Possible Carriers of *Fusarium* Wilt (p. 969), and On a Black Crown Rot of Greenhouse Snapdragons Caused by *Myrothecium roridum* Tode (pp. 969, 970), both by J. J. Taubenhaus; Mode of Action of Bordeaux on *Mycosphaerella fragariae*, by A. G. Plakidas (p. 970); A Resumé of Cottonseed Treatments in South Carolina, by C. H. Arndt (p. 970); The Reaction of Several Isolations of the Cotton-Wilt Fungus to Toxic Dyes, by G. M. Armstrong and C. N. Clayton (pp. 970, 971); Studies on Downy Mildew of Tobacco, by G. M. Armstrong and C. B. Sumner (p. 971); Dissemination of the Bacterial Leaf Spot Organism [*Bacterium malvacearum*], by F. M. Rolfs (p. 971); Breeding Peanuts for Disease Resistance (pp. 971, 972) and Results From Ten Years' Work on Cotton Seed Treatment (p. 972), both by B. B. Higgins; Report of One Year's Test of Copper Fungicides and Other New Materials as Peach Sprays, by L. E. Miles (p. 972); Tobacco Bed Soil Disinfection, by J. O. Andes (p. 972); The *Verticillium* Wilt Disease of Cotton (pp. 972, 973) and Angular Leaf Spot of Cotton in Mississippi in 1934 (p. 973), both by L. E. Miles; Anthracnose and Wilt of Strawberry Caused by *Colletotrichum fragariae*, by A. N. Brooks (pp. 973, 974); Wilt-Resistant Cottons Adapted to the Gulf Coastal Plains, by D. C. Neal (p. 974); The Direct Effect of Bordeaux Mixture on Early Cucumber Production, by G. F. Weber (p. 974); *Sclerotinia* Rot of Irish Potatoes in Florida, by A. H. Eddins (p. 974); A Root Rot of Strawberry Caused by a Species of *Diplodia*, by R. E. Nolan (pp. 974, 975); Soil-Temperature Studies on Florida Cigar-Wrapper Tobacco, by R. R. Kincaid and L. O. Gratz (p. 975); The Effect of Certain Environmental Factors on the Germination of Florida Cigar-Wrapper Tobacco Seeds, by R. R. Kincaid (p. 975); Field Studies of *Fusarium* Wilt of Cotton, by C. D. Sherbakoff and G. M. Stone (p. 975); Effect of Crown Gall, Hairy Root, and Woolly Aphis on Apple Trees in the Orchard, by C. D. Sherbakoff and J. A. McClintock (pp. 975, 976); Control of Sweet-Potato Stem Rot in West Tennessee, by G. M. Stone (p. 976); *Lespedeza sericea* Stem Blight, by J. K. Underwood (p. 976); and Black Root Rot [*Xylaria mali*] of Apple, by J. O. Andes (p. 976).

[Plant disease research at Rothamsted, 1934] (*Rothamsted Expt. Sta., Harpenden, Rpt., 1934, pp. 31–33, 73–77*).—In these pages a brief report is given of the work of the plant pathology department relative to antagonisms among soil fungi, suggesting this method for the control of pathogenic soil fungi, and to the project concerned with the general study of viruses rather than with specific research on individual diseases and crops.

A summary with notes on the fungus diseases at Rothamsted and Woburn (1933–34), by M. D. Glynne, includes those of wheat, oats, barley, rye, grasses, clover, lucerne, broadbeans, potatoes, sugar beets, mangolds, swedes, kale, brussels sprouts, cabbage, and carrot.

Annual report of the mycologist for the year 1934, R. M. Nattrass (*Cyprus Dept. Agr. Ann. Rpt., 1934, pp. 45–49*).—This reviews the seasonal status and progress of observations and investigations of various plant diseases in Cyprus, including a bacterial disease of wheat new to Cyprus and probably due to *Bacterium tritici*, and the first observance of *Cuscuta epilinum* on flax.

Seed treatment tests against covered smut of wheat and barley and trials with two resistant Australian varieties of wheat (Geeralying and Nawaba) gave promising results, and trials with rust-resistant cowpeas are reported.

Mycological notes for 1933, L. O. Overholts (*Mycologia, 26 (1934), No. 6, pp. 502–515, pls. 2, fig. 1*).—This contribution from the Pennsylvania State College, a continuation of previous reports (E. S. R., 74, p. 211), includes local and morphological or systematic notes on 15 Fungi Imperfecti; 5 Ascomycetes; 1 smut; 4 rusts; and 13 Hymenomycetales. Included are the following: *Cor-*

ticium fenestratum n. nom., and *C. botryoideum*, *Peniophora delectans*, and *P. dissoluta* n. spp. These and the evidently rare *Lentinus haematopus* are illustrated.

A tube for culturing fungi, T. C. Scheffer (*Science, 82 (1935), No. 2133, pp. 467, 468, fig. 1*).—The apparatus described consists of an ordinary test tube modified by a rounded invagination of the wall on one side near the mouth, thus permitting solidification of culture media in a narrow, horizontal strip along one side of the tube, with consequent advantages for surface observation.

A method for irrigating fungus cultures, D. Pease (*Science, 82 (1935), No. 2129, pp. 377, 378, figs. 2*).—The method described consists in enclosing a van Tieghem ring in the Petri dish and sterilizing the two together, agar or other media being poured around the ring and allowed to harden. Sterile water introduced from time to time into the well formed by the ring seeps slowly out into the agar, thus preventing the drying up of the culture before observations are completed.

The cytology of host-parasite relations, M. A. Rice (*Bot. Rev., 1 (1935), No. 9, pp. 327–354, pl. 1*).—The author critically reviews the present status of knowledge relative to the physiology and cytology of parasitism, with special reference to the rust fungi but against a background of other types of fungus and of bacterial parasites. A bibliography of 73 titles is appended.

The physiology of virus diseases in plants, V–VII, J. Caldwell (*Ann. Appl. Biol., 21 (1934), No. 2, pp. 191–205, pl. 1; 206–224, pls. 2, figs. 7; 22 (1935), No. 1, pp. 66–85, pls. 2*).—Three papers of the series are included.

V. *The movement of the virus agent in tobacco and tomato.*—"Experiments on the movement of the virus of aucuba or yellow mosaic of the tomato in the host plant are described. It has been found that the presence of the virus in the tissues is not always associated with symptoms and that the symptoms appear in those tissues which have developed after infection. It was also found that the distribution of the virus throughout the plant was not uniform. In the chlorotic tissues the virus content was higher than in the neighboring green areas.

"A large series of experiments has been carried out on the transmission of six different viruses in the seed of tomato or tobacco. In no instance was there any evidence of transmission, and it is suggested that the chance of seed transmission of these viruses is very slight.

"The movement of the virus from an infected leaf and the possibility of its being carried with the food material were examined, and results are given which show that the virus can move independently of the food materials and that, under certain conditions, the virus apparently moves in the direction opposite to that of the metabolites."

VI. *Some effects of mosaic on the metabolism of the tomato.*—"The literature dealing with the effect of virus diseases on the metabolism of the host plants is briefly summarized. Results are presented of work which has been carried out on the aucuba or yellow mosaic in tomato. The effect of time of inoculation has been studied in some detail. It has been found that the plant is generally reduced by the disease and that the carbohydrate and dry-matter content of the diseased plants is less than that of the controls. The stage of development of the plant is not apparently affected by the disease; the diseased plants, though reduced in size, have the same number of leaves and flower trusses as the controls. The nitrogen content is not materially affected by the disease. The effect of the disease on the respiratory mechanism of the host tissues has been examined, and it has been established that the CO_2 output of these tissues is higher than that of the controls. This is found when the output is expressed in milligrams of CO_2 per 8-hr. period in terms of the initial fresh weight, the residual dry-matter content, or of the residual nitrogen content. The higher CO_2 output is also found in respiration in oxygen or in nitrogen. This has been attributed to an increase in the efficiency of the enzyme system of the diseased plants."

VII. *Experiments on the purification of the virus of yellow mosaic of tomato.*—The author used slight modifications of the methods of Vinson and Petre (E. S. R., 65, p. 843) for purification of the virus from infectious juice and subsequent elution, and at each stage of the experiments tests were made by inoculation into leaves of *Nicotiana glutinosa* to determine the amount of active virus left after each treatment. No evidence was found that this virus could be recovered in a crystalline form, and viruliferous crystalline material always contained traces of organic nitrogen. The virus proved to be active over a range of from pH 2.0 to 10.5. At the extremes the excessive acidity and alkalinity were toxic to the inoculated leaves, so that previous adjustments were necessary. In an attempt to free the virus of proteins, electrolytic methods and various other protein precipitants were tried and proteolytic enzymes used on the purified virus, but the results were rather unsatisfactory. It proved difficult to insure that the effect of some reagents was on the virus rather than on the plant tissues, but from the precipitation experiments as a whole it may be concluded that the virus is either protein in nature or is so closely adsorbed to the protein that on any alteration of the physical state of the juice it reacts as does the protein.

The inhibiting influence of a virus on one of its mutants, H. H. McKinney (*Science, 82 (1935), No. 2133, pp. 463, 464*).—The author reports experimental data supporting the view that the virus of common mosaic of tobacco acts as an immunizing agent or "vaccine" against the yellow mosaic virus, suppressing the development of the latter (considered to be a mutant of the common mosaic virus) and finally inducing what possibly may be a cure for the yellow mosaic in parts of the plant developed after sufficient time for its action.

Related phenomena and possible practical applications are discussed.

Particle diameter of certain plant viruses and Phytomonas pruni bacteriophage, H. H. Thornberry (*Phytopathology, 25 (1935), No. 10, pp. 938–946*).—Thirteen plant viruses (Johnson's tobacco mosaic Nos. 1 and 6, Holmes' masked tobacco mosaic, Bewley's aucuba mosaic of tomato, Kunkel's second attenuated strain of aucuba mosaic, Jensen's yellow tobacco mosaic Nos. 101, 102, and 7a, Valleau's yellow ring spot and green ring spot of tobacco, Winyard's ring spot of tobacco, Porter's cucumber mosaic, Johnson's ring spot of potato, and Stanley's purified tobacco mosaic) in nonpurified preparations were found to pass collodion membranes of similar pore diameter. From the end point of ultrafiltration and the calculated pore diameters of the membranes, the particle diameter of each of these viruses was estimated to be 15 mμ. Tobacco-mosaic samples purified by the lead acetate method and broth suspensions of *P. pruni* bacteriophage contained infectious particles estimated to be 11 mμ in diameter. Some of the factors influencing the determination of particle diameter by ultrafiltration analysis are discussed.—(*Courtesy Biol. Abs.*)

Deamination in virus-infected plants, A. V. V. Iyengar (*Nature [London], 135 (1935), No. 3409, p. 345*).—This preliminary note reports that in spiked sandal, ammonia and hydroxy acids (malic and succinic) are increased. These changes suggested the presence of an active deaminase, and tests confirmed its presence.—(*Courtesy Biol. Abs.*)

Witches'-broom and crown gall [trans. title], J. Magrou (*Ann. Sci. Nat., Bot., 10. ser., 17 (1935), No. 1, pp. 85, 86, pls. 2*).—This note describes and figures malformations of the witches'-broom type in a specimen of *Chrysanthemum frutescens* bearing tumors induced by inoculation with *Bacterium tumefaciens*.

Pythium in phanerogamic water plants [trans. title], B. T. Palm (*Bot. Notiser, 1935, No. 3–4, pp. 317, 318; Eng. abs., p. 318*).—To the list of host plants of *P. debaryanum* are added the following phanerogamic water plants: *Iris pseudacorus*, *Nymphaea alba*, and *Sparganium simplex*. Large, blackish spots were caused on *N. alba* and less extensive grayish discolorations on *S. simplex* and *I. pseudacorus* in the Botanical Garden at Lund, Sweden. The fungus was repeatedly isolated from necrotic tissues of these plants, and infection experiments and reisolations from *N. alba* have established its pathogenicity.

Fungicidal value of some common dyes against dermatophytic fungi, A. McCrea (*Mycologia, 26 (1934), No. 5, pp. 449–453*).—The author reviews the literature of the subject, and summarizes her own studies as indicating that malachite green and brilliant green are greatly superior in potency to any other dyes tested and are of about equal fungicidal value. They showed a decided selective action on the fungi tested, *Epidermophyton rubrum* and *Aspergillus niger* proving considerably more resistant than *Trichophyton interdigitale*. Selective action was also shown by aniline violet, but neither gentian violet nor basic fuchsin gave any significant fungicidal action.

Effect on transpiration of varying the copper-lime ratio in bordeaux mixtures, J. D. Wilson and H. A. Runnels (*Ohio Sta. Bimo. Bul. 177 (1935), pp. 206–209*).—When coleus plants growing in tinned cans were treated by bordeaux mixture varied from a 15–3–50 to a 3–15–50 formula, the maximum effect on the transpiration rate was induced by the 3–6–50 mixture. As the $CuSO_4$ was increased beyond 3 lb. to 50 gal. of water, the effect on transpiration decreased, and the same was true to a less extent when the lime was increased above 6 lb.

Increases in the $CuSO_4$ content of the spray increased slightly the water requirement of the plants treated. The leaves were injured by a 15–3–50 mixture. Increases in the amount of hydrated lime used in the formula resulted in a decreased growth and an increased water requirement in the plants treated. The latter was also true for tomatoes. The growth and transpiration rates of potatoes and celery were much less affected by variations in the formulas used.

Plasmolysis and vital staining of spores and young germ tubes of cereal rust fungi [trans. title], L. Ronsdorf (*Phytopath. Ztschr., 7 (1934), No. 1, pp. 31–42, figs. 2*).—Most of the study here reported was with *Puccinia simplex* grown at room temperature. The spores were mounted in a drop of water on slides, and after germination had reached the desired point the water was removed by blotting and the plasmolyzing agent (mostly cane sugar or $CaCl_2$ solutions) added.

The osmotic value as expressed by marginal plasmolysis of the spores was 1.8 M of cane sugar (49.5 atmospheres), that for the germ tubes 0.9 M (30.4 atm.). With $CaCl_2$ the values for spores and germ tubes were, respectively, 0.85 M (66.9 atm.) and 0.5 M (34.9 atm.). With an 0.8 M solution of $CaCl_2$ *P. triticina* and *P. dispersa* germinated only slightly and *P. simplex* and *P. glumarum* not at all, but *P. coronifera* and *P. graminis* grew almost normally. Temperature, light, and age of spore had no appreciable effects on the results in plasmolysis.

Methylene blue and neutral red were tested in various dilutions from 1:1,000 to 1:1,000,000 as to their effects on the spore and germ tube. The former proved the more toxic, permitting only a trace of germination at 1:1,000 for 20 hr., while neutral red at the same strength gave a 5 percent germination. In both cases the 1:100,000 concentration stained the vital parts clearly.—(*Courtesy Biol. Abs.*)

The influence on rust susceptibility of immersing inoculated wheat leaves in solutions of mineral salts and other substances [trans. title], G. Gassner and K. Hassebrauk (*Phytopath. Ztschr., 5 (1933), No. 4, pp. 323–342, figs. 5*).—To test the influence which phosphorus, potassium, and nitrogen might have on the susceptibility of wheat to *Puccinia triticina*, inoculated leaves were hung in their solutions for from 3 to 4 nights by turning the pots of plants upside down over glass tanks containing $\frac{1}{16}$, $\frac{1}{32}$, and $\frac{1}{64}$ M concentrations of salts of these elements. The plants had been inoculated and held under moist bell jars for 2 days before such treatment. Among the salts of K used were KCl, K_2SO_4, KH_2PO_4, K_2HPO_4, K_3PO_4, KNO_3, KBr, and $KHCO_3$. An increase of resistance to rust followed the increase of K in the solution. In testing the influence of P the above-named salts were employed, as well as those in which the K was replaced with Na and with NH_4. The P salts also increased the resistance. Nitrogen increased the susceptibility, the greatest change being induced by NH_4 salts or glycocol, less with $Ca(NO_3)_2$ and $Mg(NO_3)_2$ and asparagine, and least with KNO_3 and $NaNO_3$. When treatments with the salt solutions were made 4 days before inoculation, susceptibility was uninfluenced.—(*Courtesy Biol. Abs.*)

Some comparative studies of the shifting of rust resistance in relation to the stage of development of cereal plants [trans. title], G. Gassner and H. Kirchhoff (*Phytopath. Ztschr., 7 (1934), No. 1, pp. 43–52*).—Earlier investigations in Germany (E. S. R., 36, p. 542) had shown wheat in the seedling stage to be susceptible to *Puccinia triticina*. However, as the blossom stage was approached a period of definite resistance was developed, followed when the leaves became old by a second stage of susceptibility. With *P. graminis* and *P. coronifera*, the younger plants were more resistant than the older ones.

The present study was undertaken to determine whether the same results could be obtained in South America, where the high humidity is extremely favorable to infection. In inoculations with *P. triticina* race 14, *P. simplex* race 2, and *P. coronifera*, the last was less virulent than usual because of the high summer temperature. The time of greatest susceptibility of the others was also slightly shifted because of environmental conditions. It is thus evident that the results obtained in Germany are not always comparable to those in the maritime areas of South America.—(*Courtesy Biol. Abs.*)

Two-year field tests concerning the influence of manuring on the rust susceptibility of cereal plants [trans. title], G. Gassner and K. Hassebrauk (*Phytopath. Ztschr., 7 (1934), No. 1, pp. 53–61*).—The previous studies reported (see above) dealt with the application of mineral salts to seedlings in the greenhouse. The present discussion deals with similar experiments under field conditions where various plats lacked one of the three elements potassium, phosphorus, or nitrogen in comparison with others having complete fertilizer or none. The pathogens used were *Puccinia triticina* race 14, *P. glumarum* race 4, *P. coronifera* race Braunschweig, and *P. sorghi*. Several wheat varieties and one variety each of oats and corn were used, and great care was taken to compare only the leaves of equal age.

The results obtained were similar to those in the greenhouse. The rust on wheat showed a marked increase in the plats lacking only K. On oats the increase was in the plats with complete fertilizer. On corn the plats with complete or no fertilizer and those lacking K all had about an equal increase in rust over those lacking P or N.—(*Courtesy Biol. Abs.*)

The influence of mineral salt nutrition on the susceptibility of the standard variety collection used in the determination of the races of cereal rusts [trans. title], G. Gassner and K. Hassebrauk (*Phytopath. Ztschr., 7 (1934), No. 1, pp. 63–72*).—The rusts employed in this study were *Puccinia triticina* race 14, *P. glumarum tritici* races 4 and 7, *P. coronifera avenae* race

Braunschweig, and *P. simplex* race 2. The sand cultures were varied by withholding nitrogen from some and potassium from others. Earlier trials had shown that a lack of phosphorus had but little influence on the incidence of rust but reduced the growth of the plants, therefore the amount of phosphorus was not varied in these tests.

Six tables of results are given to substantiate the authors' conclusions that in testing for definite rust races or forms much more attention should be given to the soil conditions than has previously been the case. However, it is felt that artificial media with definitely known composition are unnecessary.—(*Courtesy Biol. Abs.*)

Stem rust epidemics and wheat breeding, L. R. WALDRON (*North Dakota Sta. Circ. 57 (1935), pp. 12, figs. 3*).—The author discusses specifically the rust epidemics of 1904, 1916, and 1935, the causes of rust epidemics in general, the losses involved, the methods of fighting rust epidemics, and the breeding of wheat for rust resistance. Under the last heading promising hybrids and selections by the author are described.

It is believed that the data here brought together indicate clearly that since the rust epidemic of 1916 great strides have been made toward eliminating rust losses from possible future epidemics.

Seed treatments for the control of certain diseases of wheat, oats, and barley, B. KOEHLER (*Illinois Sta. Bul. 420 (1935), pp. 497–575, figs. 17*).—This comprehensive account includes a historical résumé and full discussions of those diseases of wheat, oats, and barley which can be controlled, or certain phases of which can be controlled, by seed treatment (seedling diseases of cereals; bunt, loose smut, and scab of wheat; smuts of oats; and loose and covered smuts, stripe, scab, and blight of barley), results of experiments in Illinois extending over a period of 12 yr., and directions for applying disinfectants. The main results of the experimental work may be summarized as follows:

Yield tests with treated grain were conducted by the rod-row method at the station farm and at several other places, and 70 cooperative tests by farmers were also made with oats and barley on a larger scale under farm conditions. Two of the dry disinfectants tested—copper carbonate and ethyl mercury phosphate—proved to be outstanding.

Control and yield increases were obtained with wheat seed infected with bunt when treated with copper carbonate, ethyl mercury chloride (Ceresan), and ethyl mercury phosphate (New Ceresan). The seedling disease due to scab was best controlled by the organic mercury compounds. The winter survival was increased under all three treatments. In areas where wheat is extensively grown, yearly treatment of the seed is recommended, and in other areas only when bunt or scab infection occurs.

Oat smuts were well controlled by several formaldehyde methods and by the two organic mercury compounds. New Ceresan gave better yields than formaldehyde. The latter as a dust deteriorated rapidly in storage. For these smuts, treatment at least every second year is recommended.

For the barley diseases, the two organic mercury compounds were outstanding in control and in increasing yields of grain. Wisconsin Pedigree 38 barley proved highly resistant to stripe and thus far has not shown much smut.

Some of the seedling diseases and the latent smut infection of cereals were probably controlled by the better seed disinfectants, since the yields from treated seed were increased.

The machine method of applying formaldehyde dust or New Ceresan to oats was much more effective than the shovel method both as to yield and smut control. Storage of copper carbonate treated seed for a year resulted in no damage, but the formaldehyde dust and the two organic mercury compounds caused some decrease in yields with even a week's storage. Since smaller dosages of the last three disinfectants than are customary were effective for smut control when the oat seeds were stored for a period after treatment, it is believed that a dosage can be determined that will give as satisfactory results, with storage, as the fresh treatment.

A list of 92 citations to the literature is appended.

Angiopsora, a new genus of rusts on grasses, E. B. MAINS (*Mycologia, 26 (1934), No. 2, pp. 122–132, pls. 4*).—As a result of his studies of the grass rusts with their catenulate teliospores, the author creates for this group the new genus *Angiopsora,* with *A. lenticularis* n. sp. and three new combinations (all illustrated). The new genus is placed in association with *Bubakia* and *Phakopsora* of the Melampsoraceae.

Studies on Rhizobium leguminosarum of berseem (Trifolium alexandrinum), M. R. MADHOK (*Indian Jour. Agr. Sci., 5 (1935), No. 3, pp. 428–444*).—*R. leguminosarum* on *T. alexandrinum* is described, and its cultural characters are given. Its pH tolerance was 5 on the acid and about 9.8 on the alkaline side. Its motility was low. The thermal death point lay between 52° and 54° C., but it survived 75° in fully grown soil cultures. It proved sensitive to ultraviolet light. The organism retained its infective power on seeds stored in Petri dishes for only about 7 weeks. It cross inoculated with an organism on the roots of shaftal (*T. resupinatum*).

Peronospora in storage cabbage, G. B. RAMSEY (*Phytopathology, 25 (1935), No. 10, pp. 955–957, fig. 1*).—Serious discoloration and break-down of Wisconsin cabbage in storage proved to be due to *P. parasitica.* From the infected lower leaves of maturing heads the fungus followed the parenchyma tissues into the pith region of the stem and from there worked upward through the head. Grayish black discolorations of stems and inner leaves often made the heads unmarketable. Bacterial soft rot and *Alternaria* rot caused great loss in some bins of cabbage by secondary infection of the tissues invaded by *Peronospora.*—(*Courtesy Biol. Abs.*)

Classification of southern celery-mosaic virus, W. C. PRICE (*Phytopathology, 25 (1935), No. 10, pp. 947–954, figs. 4*).—Continuing these studies (E. S. R., 74, p. 62), the author reports that plants of the Golden Gem Midget variety of *Zinnia elegans* infected with this virus became specifically immune to infection with a yellow strain of cucumber-mosaic virus. It is therefore believed that these two viruses are closely related immunologically and that the celery virus should be classified as a strain of the cucumber virus. This conclusion is corroborated by the fact that the celery-mosaic and cucumber-mosaic viruses produce similar symptoms in *Zea mays, Commelina communis,* and *Vigna sinensis.*—(*Courtesy Biol. Abs.*)

A probable vector of cassava mosaic in southern Nigeria, F. D. GOLDING (*Trop. Agr.* [*Trinidad*], *12 (1935), No. 8, p. 215*).—Using two infected and two healthy cuttings of bitter cassava (*Manihot utilissima*) in each of two insect-proof cages, the author obtained mosaic infection in the developing healthy plants in the cage into which a total of 814 individuals of the aleurodid *Bemisia nigeriensis* had been introduced at intervals, but not in the insect-free cage.

Rhopographus zeae on corn, R. K. VOORHEES (*Mycologia, 26 (1934), No. 2, pp. 115–117, pls. 2*).—At the Florida Experiment Station the author studied, and here describes, the imperfect stage of *R. zeae* as *Clasterosporium longisporum* n. sp. Both stages are illustrated. Observations showed that in the field the fungus does not attack cornstalks until after they have matured.

Life history of a Cercospora leaf spot fungus of cowpea, D. H. Latham (*Mycologia, 26 (1934), No. 6, pp. 516–527, pl. 1, figs. 2*).—This paper reports the results of studies of the hosts, symptoms, and range of the disease and of the pathogenesis, morphology, and life history of the fungus shown to be the cause, hitherto known only under the conidial form *C. cruenta*. The perithecial stage was demonstrated and is here described as *Mycosphaerella cruenta* n. comb. The spermagonial stage is also described, and all three stages are shown to be genetically connected.

Botrytis disease of lettuce, M. M. Abdel-Salam (*Jour. Pomol. and Hort. Sci., 12 (1934), No. 1, pp. 15–35, pl. 1*).—This *Botrytis* disease is reported to be widely distributed and to cause severe losses in England. Observations on its seasonal occurrence indicated the most serious phase of attack to be the collar rot ("red-leg") form on overwintered seedlings when planted out in the spring, but some losses are also caused in fall sowings in the open. The various types of the disease and their symptoms are described. The incidence was increased by abnormally early sowings in the fall, and overwintered seedlings transplanted early in the spring had a higher incidence than those set out later.

From the isolations made, 13 strains of *B. cinerea* were obtained, falling into two distinct groups—one with profuse sclerotial development and few conidia, the other with abundant conidia and either few or numerous sclerotia.

Either artificial or spontaneous infection was much less in the warm greenhouse than in the coldframes. High humidity favored attack, and that of the air is probably more conducive to the progress of infection than soil humidity.

Of 10 varieties of lettuce tested, the cabbage type Lee Immense proved most resistant, followed by the Cos types Bath Black-Seeded and Hicks Hardy White. Active lesions may definitely heal up, and it is suggested that resistance is correlated with the development of an infiltrated layer of a gumlike substance in the bordering healthy tissues.

Steeping the overwintered seedlings at transplantation time in 0.5 percent Uspulun or Nu-green solutions for from 0.5 to 1 hr. gave promise for the red-leg stage of the disease, but watering the soil in the frames with Uspulun during the growth of the seedlings caused considerable permanent stunting.

On the Botrytis disease of lettuce, with special reference to its control, W. Brown (*Jour. Pomol. and Hort. Sci., 13 (1935), No. 3, pp. 247–259*).—The author reviews the previous phases of this work on lettuce diseases by Abdel-Salam (see above), and then details his experiments of the 1934 and 1935 seasons, the main results of which were as follows:

Frame culture leads to considerable risk from fungus (and more particularly *Botrytis*) infection. Repetition of the tests with Uspulun and with mercuric chloride confirmed earlier results in that there was appreciable control but that the danger of damage to the seedlings restricted the value of these methods. Tests with the nonmercurial dust Brassisan (the effective constituent of which is the chloronitrobenzene preparation) gave favorable results in control, and the only case of severe damage was where the roots had been liberally coated with the dust. No injury or check to growth was noted when seedlings were dusted in situ a few hours before pulling for transplantation. The risk of damage from Brassisan may be dismissed as negligible. Whether or not a preliminary wetting of the seedlings in the frame is advisable cannot be definitely stated, since the evidence in its favor was based on the results of treatments given in the open.

The mycorrhizas of the potato [trans. title], J. Costantin and J. Magrou (*Ann. Sci. Nat., Bot., 10. ser., 17 (1935), No. 1, pp. 37–50, pls. 2*).—Potatoes from seeds sown in the Pyrenees and planted in previously uncultivated soils at different altitudes and in different stations presented very characteristic endotrophic mycorrhizas. The infestation was usually abundant but was local or lacking in certain individuals. In potatoes from seeds planted at the same stations but in arable soils, the mycorrhizas were often lacking or were rare. The virgin soils from which these mycorrhizas originated carried a varied flora, but no Solanaceae. The potato is thus capable of initiating a symbiotic relation with the endophytes of other plant families.

Although the mycorrhizas hitherto reported for potatoes and other species of the genus have been described as exclusively intracellular, those here described were often intercellular. Thus one and the same species of plant may live in symbiosis with two different types of endophytes, and the different modes of growth of the two forms appear to be characteristic and not induced by the anatomical peculiarities of the tissues which harbor them.

Investigations of the virus diseases of the potato.—III, Further experiments with viruses of the mosaic group [trans. title], E. Köhler (*Phytopath. Ztschr.*, 7 (*1934*), *No. 1, pp. 1–30, figs. 17*).—In continuation of previous studies of various strains of potato mosaic viruses (E. S. R., 72, p. 797), the following results were obtained:

The author's strain R 77 is apparently a mixed virus with one element similar to a weak strain of K. M. Smith's Y virus. This was further confirmed by its successful passage through *Solanum nigrum*, *Nicotiana glutinosa*, and *Nicandra physaloides*, and the elimination of the Y element when inoculated into *S. racemigerum* and *Datura stramonium*. With this element eliminated the virus no longer cleared the veins, nor did it produce the true flecking which later was determined to be a diagnostic character of the mixture in R 77. In its purified form it resembled the "ring" viruses M 23 and H 19. When the Y component was added to the "purified" R virus the original R 77 virus resulted.

The real cause of the change lay in the elimination of one component rather than in a weakening of the virus by passage through *Datura*. When viruses M 23, H 19, or G. A. are passed through the Wohltmann potato variety there is no change in them, but when they are passed through the Erdgold variety there may be a change in M 23, though this is not determined with certainty. However, when R 77 was passed through either of these varieties there was a very definite change, in both cases the resulting virus being weaker than either the mixed or the purified R 77. When, after passage through the potato, the viruses were heated to from 58° to 60° C. it was shown that the potato host not only eliminated the concomitant strain Yr, but also weakened the R strain.

A dark mosaic on the Erdgold variety appeared in the greenhouse but was latent in the field. The various strains of virus isolated by the author were added to such greenhouse stock, as well as to potato plants plainly showing various types of mosaic. The resulting symptoms are described and the similarities and differences pointed out for each case. The results indicated that the five strains M 23, H 19, R, Wo 8, and E 1 continued to be distinct from one another but that all belonged to the ring spot group of viruses. They may appear together or separately, and may be masked in one host and not in another.—(*Courtesy Biol. Abs.*)

Parasitism of Sclerotium oryzae Catt., B. B. Mundkur (*Indian Jour. Agr. Sci.*, *5* (*1935*), *No. 3, pp. 393–414*).—The symptoms of rice diseases due to *Sclerotium oryzae* as described by different investigators are compared.

Cultures of *Sclerotium* spp. from various sources were grouped into four categories, and studies of the morphology and parasitism of two of them are here reported. One of them, with colored hyphae and small, smooth sclerotia and inducing changes in the color of the substrates, was identified as *S.*

oryzae. In culture it produced conidia of *Helminthosporium sigmoideum*. The ascigerous stage was not produced, but by analogy it is referred to *Leptosphaeria salvinii*. The second form, with hyaline hyphae and larger, rough-surfaced sclerotia and not inducing changes in the color of the substrate, was identified as *Rhizoctonia microsclerotia*.

S. oryzae failed to induce infection either in pots or in fields heavily infested with the sclerotia, but in test tube experiments the disease was produced. Pot tests with *R. microsclerotia* also gave negative results. However, *S. oryzae* occurred in the rice fields, and the sclerotia were seen on the sheaths and culms of healthy plants. Sterility could not be correlated with the presence of the fungus. It is therefore concluded that under normal conditions in India these fungi are unable to produce disease in the rice crop.

Toxicity of low concentrations of ammonia to mycelium and sclerotia of Sclerotium rolfsii, L. D. LEACH and A. E. DAVEY (*Phytopathology, 25 (1935), No. 10, pp. 957–959, fig. 1*).—Working at the College of Agriculture, Davis, Calif., 24 hr. of exposure in aqueous solutions containing 50 p. p. m. of ammonia proved lethal to mycelium of *S. rolfsii* and in those containing 250 p. p. m. to sclerotia. Formaldehyde was less toxic. Either anhydrous ammonia or ammonium sulfate dissolved in irrigation water at approximately 300 p. p. m. of NH_3 significantly reduced the percentage of infection and increased the yield of sugar beets in heavily infested fields.

The sugar beet as a host of Heterodera marioni (syn. H. radicicola) [trans. title], O. MUNERATI (*Indus. Sac. Ital., 28 (1935), No. 2, pp. 58–61, fig. 1*).—This nematode is reported as causing decreases in the weight and sugar content of sugar beet roots.—(*Courtesy Biol. Abs.*)

Organisms associated with sugarcane mosaic and their relation to the mosaic virus, S. V. DESAI (*Indian Jour. Agr. Sci., 5 (1935), No. 3, pp. 367–386*).—The author gives a preliminary report of the isolation of a bacterium with a filter-passing stage from mosaic-infected sugarcane leaves. Serological tests suggested the mosaic virus to be the filter passing stage of the bacterium. The batcerium stage differed antigenically from the other stages of the life cycle and also from the mosaic virus. No prophylactic powers were shown by antisera either of the bacterium or of the mosaic virus.

The life cycle of the organism isolated was divided into the following stages: (1) Filtrable and invisible (virus), (2) filtrable and visible ("G" type of Hadley), (3) nonfiltrable and visible (bacterial), and (4) spore stages. It is reported to differ in cultural and biochemical reactions from all bacteria hitherto known.

Stinking rot of sugarcane, S. V. DESAI (*Indian Jour. Agr. Sci., 5 (1935), No. 3, pp. 387–392*).—The author describes the symptoms of this stem disease, usually associated with stem injuries, from which two bacterial types were isolated, the one white and the other bluish on agar media. By inoculation tests the latter form was shown to be pathogenic, and when inoculated into borer holes it produced the characteristic disintegration and fermentation. The biochemical reactions of the organism and comparisons with related bacteria led to its designation as *B*[*acillus*] *pyocyaneus saccharum* n. v.

The white form caused no infection alone, but when inoculated along with the bluish form the pathogenic efficiency of the latter was increased.

Heterothallism of sunflower powdery mildew, C. E. YARWOOD (*Science, 82 (1935), No. 2131, pp. 417, 418*).—In this preliminary note the author presents experimental data considered to be reasonable proof of heterothallism in *Erysiphe cichoracearum* on *Helianthus annuus*. This is believed to be the first record of heterothallism in the Erysiphaceae.

Chemical studies on the virus of tobacco mosaic, IV, V, W. M. Stanley (*Phytopathology, 25* (*1935*), *No. 10, pp. 899–921, 922–930*).—A continuation of this series of studies (E. S. R., 73, p. 633).

IV. *Some effects of different chemical agents on infectivity.*—The effect of 110 chemicals on the infectivity of purified preparations of tobacco-mosaic virus was determined. Many of them affected neither the virus nor the test plant. A few caused an increase and many a marked decrease in the infectivity of the virus. The necessity of differentiating between the action of chemical on virus and that of chemical on plant was demonstrated. In general, the chemicals with a direct inactivating action on tobacco-mosaic virus may be classified as oxidizing and protein-precipitating agents and agents causing an H-ion concentration known to inactivate the virus. The fact that tobacco-mosaic virus was unaffected over long periods by concentrations of mercuric chloride known to be germicidal suggests that the virus is not a bacterial organism. Virus in purified preparations was affected by mercuric chloride at pH 6, 7, and 8 to a markedly greater extent than at pH 3, 4, and 5. These results accord with recent evidence that this virus is a protein. Dipotassium phosphate or phosphate buffers near pH 7 cause a marked increase in its infectivity when tested in *Phaseolus vulgaris*, but when tested in Turkish tobacco plants they may cause a reduced infectivity, and in *Nicotiana glutinosa* no change or an increase or decrease in infectivity. Charcoal may cause no change or an increase or decrease in infectivity, depending on the ratio of amount of charcoal to amount of virus. The virus may be completely removed from solution by adsorption on charcoal. Maximum adsorption occurs at from pH 3 to 5 and with very finely divided charcoal.

V. *Determination of optimum hydrogen-ion concentrations for purification by precipitation with lead acetate.*—The optimum H-ion concentrations for carrying out the three principal steps in the lead acetate method for purification of tobacco-mosaic virus proposed by Vinson and Petre (E. S. R., 65, p. 843) were determined. That for lead subacetate precipitation was about pH 9, for neutral lead acetate precipitation about pH 5.5, and for elution of the virus from the neutral lead acetate precipitate about pH 7. A greatly increased virus yield was obtained by modifying their process slightly and carrying out the lead subacetate precipitation at about pH 9 instead of at pH 6.5. The modified process proved very useful for the rapid preparation of colorless, partially purified solutions with a virus concentration equal to or somewhat greater than that of the original material.

Effect of tannic acid on the infectivity of tobacco-mosaic virus, H. H. Thornberry (*Phytopathology, 25* (*1935*), *No. 10, pp. 931–937*).—At 1 percent or higher concentrations for 15 min., tannic acid prevented infection of Scotia bean plants by tobacco-mosaic virus. At lower concentrations infection was reduced as the concentration was increased. On removal of the acid either by ultrafiltration or by precipitation from the virus suspension with gelatin a part of the infectivity was restored. When applied to the plant before inoculation at from 0.01 to 10 percent concentrations, tannic acid greatly reduced, but in no case completely prevented, infection, and the degree of inhibition was proportional to the concentration of the acid.

Soil-temperature studies on Florida cigar-wrapper tobacco, R. R. Kincaid and L. O. Gratz (*Jour. Agr. Res.* [*U. S.*], *51* (*1935*), *No. 5, pp. 441–449, figs. 3*).—The Florida Experiment Station conducted experiments "to determine the cardinal soil temperatures for the growth of transplanted cigar-wrapper tobacco seedlings. The minimum and maximum were found to be approximately 9° and 40° C., respectively, and the optimal range from about 24.5° to 32°.

"Experiments were conducted to determine the effect of constant soil temperatures on the development of black shank (*Phytophthora parasitica nicotianae* Tucker) in Round Tip tobacco plants, which are very susceptible to the disease. The minimum temperature for infection was found to vary considerably with the age of the plant, ranging from 16° or lower for newly transplanted seedlings to about 24° for plants inoculated several weeks after transplanting. The optimum is about 28° and the maximum about 34°.

"Observations on black shank in the field indicate that soil temperature is an important factor in the development of the disease."

Development of Phoma rot of tomatoes in transit and in storage, A. A. Nightingale and G. B. Ramsey (*U. S. Dept. Agr. Circ. 371 (1935), pp. 8*).—Rot due to *P. destructiva*, one of the most frequent causes of losses in tomatoes in transit and storage, has been reported from all the important tomato-growing States, but has been most serious in shipments from Florida. In this study, "mature-green" fruits selected for freedom from disease, wrapped and packed in the usual way, and shipped during four seasons from Florida to Chicago and New York showed *Phoma* rot on arrival—in the 1934 shipment, 33.8 percent. About 88 percent of the lesions in the last shipment were on ripe fruits which could still be marketed, but lesions also occurred on green fruits. Their number bore no relation to maturity, but they were larger and developed more rapidly on ripe than on green tomatoes, and the size of the lesions increased more rapidly in storage than in transit. The rate of development of the lesions also varied with the temperature. Practically all the spots developing in storage were already visible at the end of a 6- or 7-day transit period, but fruits seemingly free on arrival after from 4 to 5 days in transit often bore imperceptible infections which developed as the fruit ripened. A few new lesions developed about stem scars or injured areas from pycnospore infections in storage. Pycnidia occurred in the larger lesions on ripe tomatoes, but none were found on those that were green. By rupturing the epidermis they open the way for entry of other organisms of decay.

Apple investigations in Tasmania: Miscellaneous notes, W. M. Carne and D. Martin (*Jour. Council Sci. and Indus. Res.* [*Aust.*], *7* (*1934*), *No. 4, pp. 203–214*).—Based on original work and a review of the literature, the authors refute the theory that bitter pit is due to a virus. Four forms of crinkle are described, and susceptible apple varieties are listed. Observations and storage trials on break-down indicated its relation to water core. Water core of immature fruit, a late type, and three types of break-down following water core are described.

The molecular concentration and osmotic pressure of apple juice as calculated from the depression of the freezing point was correlated closely with the refractive index for all apple varieties tested except Cox Orange Pippin. Formulas are given.

Water-core, C. P. Harley (*Mountaineer Grower, 6* (*1935*), *No. 64, pp. 10–13*).—This is an address summarizing the experimental data on the causal relation of heat for water core of apples, on the chemical changes involved during its initiation and development, and on the most effective methods of control.

Intercellular humidity in relation to fire-blight susceptibility in apple and pear, L. Shaw (*[New York] Cornell Sta. Mem. 181* (*1935*), *pp. 40, figs. 11*).—In these studies, the methods for culturing the host plants and measuring the fire blight susceptibility have been described previously (E. S. R., 71, pp.

170, 486), and Bartlett and Kieffer pears and McIntosh, Delicious, and Yellow Transparent apples were the varieties used. The method used for measuring the relative humidity in the intercellular spaces of living plant tissues involves measurement of the turgor deficit of the cells, from which the intercellular humidity is calculated. With the aid of a table showing the relation between osmotic and vapor pressures and that between vapor pressure and relative humidity, turgor-deficit values up to 96.5 atmospheres can be rapidly converted to equivalent relative humidities. A technic for measuring the effect of relative humidity on the growth of micro-organisms in artificial media is described.

Measurements were made of the growth rate of *Erwinia amylovora* in both liquid and solid synthetic and organic media with different humidity equivalents produced by varying the concentration of various sugars therein, and in solid media with the humidity equivalents established over H_2SO_4. The results indicated a maximum growth rate at 99.9 percent r. h., about one-third of the maximum at 99, about one-twentieth at 98, very slight or no growth at 97, and no growth at 96 and 95 percent r. h.

Pear fruits and cut shoots in equilibria with different relative humidities had a maximum susceptibility at 100 percent r. h., about one-sixth of the maximum at 99, about one-tenth at 98, very slight disease development in a few cases at 97, and none at all at 96 and 95 percent r. h. Potted pear and apple plants at different atmospheric humidities and soil moistures showed high susceptibility and intercellular humidity when the environmental moisture content was high, and low susceptibility and intercellular humidity when that was low. With the average intercellular humidity between 97 and 98.5 percent, the plants were immune or only slightly susceptible, with it above 99.5 percent they were highly susceptible, and with intermediate intercellular humidities the plants were intermediate in blight susceptibility.

Preliminary measurements on orchard trees indicated significant diurnal variations in intercellular relative humidity.

From the data obtained it is concluded that intercellular humidity definitely influences the fire blight susceptibility in apples and pears, and that it is probably the major factor in the differences of susceptibility in comparable groups of plants in environments differing in moisture content.

Spraying and dusting experiments on the control of apple scab (Venturia inaequalis) and apple mildew (Podosphaera leucotricha) at East Malling in 1931–1932, M. H. Moore (*Jour. Pomol. and Hort. Sci., 12 (1934), No. 1, pp. 57–79, pls. 4*).—In continuation of this series of studies (E. S. R., 70, pp. 198, 199, 798), the following results are recorded:

The previous results were largely supported, though for the first time in 7 yr. seasonal conditions rendered two preblossom sprayings necessary for excellent scab control. A "half-strength" bordeaux mixture (4 lb. $CuSO_4$, 18 lb. hydrated lime, and 100 gal. water) caused no injury in 1932, but gave poor scab control. Colloidal sulfur, less effective than lime-sulfur, gave good control in 1931 but not in 1932. The results with sulfur dust were very beneficial, but apparently depended largely on seasonal conditions. It was useful postblossom following a preblossom wet spraying, but proved unreliable when used for both treatments. It was effective against apple mildew and red spider. Extra postblossom dustings were beneficial during the wet season of 1931, and more dust than spray applications are, in general, deemed advisable. The assembled data all point to the inference that for dusting to be most effective applications should be made before infection. At the strengths used, lime-sulfur was the best fungicide tested, giving good control of scab, mildew, and red spider. With added gelatin it was, in general, less satisfactory for scab, In 1932 fruit drop followed the postblossom use of lime-sulfur and of sulfur dust. Severe fruit russeting was noted in 1932, but is regarded as the result of the interaction on the trees, preblossom, of soft soap with lead arsenate or its derivatives.

The influence of rootstock on scab infection of leaves and fruit was noted, some evidence being obtained that the Cox Orange Pippin variety worked on certain stocks might be more easily protected by spraying or dusting than when worked on other stocks.

Certain results are used to illustrate the cumulative effects of preceding treatments on the same trees.

One spray controls peach leaf-curl, D. Cation (*Michigan Sta. Quart. Bul., 18 (1935), No. 2, pp. 86–88*).—This is a general discussion of the symptoms and control of leaf curl (*Taphrina deformans*), the most prevalent and destructive fungus disease of peach trees in Michigan. It may be completely prevented by one application of a strong fungicide during the dormant season, the standard practice in the State being an early spring treatment with 5 gal. of liquid lime-sulfur made up to 100 gal. of water, or 12.5 gal. of the lime-sulfur if the San Jose scale is also to be controlled. Leaf curl may also be controlled by a fall application of 8–8–100 bordeaux mixture.

The red spot disease of plums (Polystigma rubrum) [trans. title], V. Trifonova (*Phytopath. Ztschr., 7 (1934), No. 1, pp. 73–92, figs. 6*).—This disease is reported to be wide-spread and to cause much damage by defoliation in Bulgaria, and to be generally present in various other European countries. *P. rubrum* affects *Prunus domestica* and its varieties *P. insititia*, *P. spinosa*, and *P. divaricata*, while *Polystigma fulvum* occurs on *Prunus padus*. The taxonomy of *Polystigma rubrum* is reviewed.

The plum variety Kustendilzwetsche, which is most susceptible, is grown generally in Serbia and Bulgaria. After the fungus has killed a certain amount of tissue the mycelial threads thicken and finally produce a stroma and a pycnidium [spermagonium?]. The spring infection comes from ascospores. The pycnospores [spermatia?] germinate readily in the laboratory, but it has never been possible to cause infection with them, and their function remains unknown.

About equal control of the disease was obtained by three treatments with bordeaux mixture, lime-sulfur, or Solbar.

Trichothecium roseum, *Fusarium*, and especially *Gloeosporium polystigmicolum* are reported to grow on the stromata of the *Polystigma*. In wet weather the last named may be sufficiently abundant to check or inhibit completely the spread of the plum pathogen.—(*Courtesy Biol. Abs.*)

Blackberries: Possible source of streak infection in black raspberries, J. K. Thornton (*Phytopathology, 25 (1935), No. 10, pp. 959–961*).—In this note from the Pennsylvania State College the author, from field observations, describes a number of cases in which high percentages of the streak disease developed in black raspberries grown beside blackberries, the highest incidence always occurring in parts of plantings nearest the blackberries. It is therefore believed that the blackberries were a factor in this increased incidence of streak.

Susceptibility of raspberry species and varieties to leaf spot (Mycosphaerella rubi) at Beltsville, Maryland, G. M. Darrow (*Phytopathology, 25 (1935), No. 10, pp. 961, 962*).—Resistance to this leaf spot largely determines the hardiness of American varieties of raspberries in Maryland. When it is epidemic and the canes are nearly defoliated by August or September, the food reserves are insufficient and the canes more subject to winter injury. Twelve

Asiatic species and 11 little-known or new varieties are listed as highly resistant, while most varieties are highly susceptible.

Cytological investigations of "court-noué" of the vine [trans. title], D. RANGHIANO (*Arch. Roumain. Path. Expt. et Microbiol., 6 (1933), No. 4, pp. 353–495, pls. 23, figs. 26*).—This monographic study deals with court-noué (meaning "short internodes"), a disease further characterized by a zigzag growth of the vines and a failure of most of the flowers to develop into berries. The latter is claimed to be due to degeneration of the ovules rather than to pollen sterility. Heterotypic and homeotypic nuclear divisions of pollen mother cells occur normally in both court-noué affected and healthy *Vitis*. The nucleolus first buds out some of its material, and then the chromosomes become evident and pair into 19 bivalents which separate so that tetrads form normally. Rod-shaped mitochondria occur in the meristematic cells of both court-noué affected and healthy grapevines. As the cells differentiate some mitochondria assume the shape and function of plastids, but when the cells are affected by court-noué the plastids soon clump together, the cytoplasm assuming a reticulated appearance and outlining vacuoles wherein some osmiophilic material accumulates.

Staining sections for from 15 to 25 min. in boiling safranine, acid fuchsin, etc., demonstrated what is described as a "mycelium endophyte" in and between the degenerating cells. The results of this cytological study of healthy and diseased vines and of the host relations with this mycorrhizalike fungus are described in great detail. From these results, the author claims an intimate correlation between the pathological manifestations and the development of the endophytic mycelium. The disease is considered to be a stage or a consequence of the excessive development of this mycelium. It probably begins by living symbiotically with the healthy tissues of the plant, but gradually induces a decrease in the starch and an accumulation of fatty substances in these tissues, leading then to the characteristic deformations of the various organs, to decreased crop yields, and finally to the death of the stem.—(*Courtesy Biol. Abs.*)

Experiments on the treatment of mottle-leaf of citrus trees, E. R. PARKER (*Amer. Soc. Hort. Sci. Proc., 31 (1934), Sup., pp. 98–107*).—The author reviews the work of others on various chemical treatments for mottle-leaf, summarizes the results of studies under the auspices of the California Citrus Experiment Station conducted since 1928, and discusses further investigations still in progress.

Since the inconsistent results of the earlier tests with ferrous sulfate were correlated with the presence or absence of zinc as an impurity, it was thought possible that the effectiveness of the ferrous sulfate in the control of the disease might be not due to the iron. Accordingly, zinc sulfate was tried in various combinations with ferrous sulfate and manure applied to the soil, as zinc sulfate crystals or solutions introduced into holes in the tree trunks, and as zinc sulfate alone or in various combinations given in the form of spray treatments. Varying results in control and in injury to the trees were obtained, with the general conclusion that applications of zinc sulfate alone to the soil appear to be unsatisfactory and that direct treatment of the leaves may prove to be an effective method of control from the standpoints of cost, more uniform results, and lessening of chemical injury to the trees. The present recommendations for trial on a small scale suggest the light application of a mixture of 10 lb. of commercial zinc sulfate, 5 lb. of hydrated lime, 4 oz. of powdered blood albumin spreader, and 100 gal. of water. Treatment with zinc-containing dusts is also considered promising.

It is suggested that some questions concerning the use of zinc compounds for mottle-leaf control will not be answered until the reasons for their effectiveness or for the lack of responses are known.

Reducing decay in citrus fruits with borax, J. R. Winston (*U. S. Dept. Agr., Tech. Bul. 488 (1935), pp. 32, figs. 21*).—In comparative tests, a borax bath given to citrus fruits on arrival at the packing house satisfactorily retarded decay due to the common stem-end rot and blue mold organisms, but delayed baths were not as effective. The treatment proved to be effective on fruit needing artificial coloring, as well as on that fully colored at harvesting, but was much more effective on firm than on overripe fruit. A borax concentration of not less than 8 percent gave best results. Preferably, the wet fruits should be dried slowly and the borax left on them for several hours. In cold weather the fruit rind should be warmed to about 90° F. to retain the maximum amount of borax in solution.

The value of the treatment was observed from the transit period through to the retailer and consumer in the reduction of decay and the improved keeping quality of the fruit. The cost in commercial packing houses should not exceed from one-half to two-thirds of a cent per 100 lb. of fruit.

Gymnosporangium myricatum in relation to host parenchyma strands, B. O. Dodge (*Mycologia, 26 (1934), No. 2, pp. 181–190, pls. 2, figs. 2*).—In his study of the host-parasite relations of this fungus on the southern white cedar (*Chamaecyparis thyoides*), the following facts were brought out:

The mycelium penetrates the cortex parenchyma near the growing region and runs along vertically and radially between the host cells in fascicles or synemata. Binucleate haustorium mother cells are usually formed terminally, the subterminal cell branching out to continue growth. A thin thread penetrates the wall of the host cell, continuing on in the cytoplasm before swelling up to form the haustorium, which grows to nearly its full size without a nucleus. A mature haustorium contains two nuclei and its mother cell none.

Parenchyma and medullary ray cells adjacent to hyphae are stimulated or rejuvenated to enlarge and divide. From this there results a sort of parenchyma strand. Four or five daughter cells are often enclosed within the old wall, the daughter cells being separated merely by thin membranes. New cells may be added at the end of a strand. The pressure exerted by this forward growth often crushes the opposing cortex cells so that there is a certain amount of invasion of the cortex by a "growth."

Sections of branches killed by the fungus show the remains of the strands as brown patches or streaks. Young seedlings or branches infected in the growing region are apt to be permanently dwarfed and die early. Strands found in the wood rings were originally captured by the wood laid down around them. The reaction of the host to the stimulus coming from the invading hyphae and the morphology of the haustoria and their mother cells are rather characteristic for each species of the genus, and thus furnish additional clues for identification purposes.—(*Courtesy Biol. Abs.*)

The present status of the Dutch elm disease, G. R. Gage (*Jour. Tenn. Acad. Sci., 10 (1935), No. 2, pp. 83–85*).—This is a brief summary of present knowledge of the disease and of its history and status in Europe and in the United States.

Brittle heart in Australian timbers.—A preliminary study, H. E. Dadswell and I. Langlands (*Jour. Council Sci. and Indus. Res.* [*Aust.*], *7 (1934), No. 4, pp. 190–196, pls. 2, fig. 1*).—The authors describe this timber defect, which is widely encountered in tropical countries, and give its distribution within the tree, its mechanical and physical properties, its structure, and the methods of detection. From all the available evidence, brittle heart is most satisfactorily explained as an incipient decay. Its gradual extension with age, erratic distribution throughout the tree, changes in the properties of the timber, and the presence of fungus hyphae in all the specimens examined all favor this theory.

Longevity of Merulius lacrymans in wood destroyed by its growth, A. McCrea (*Mycologia, 26 (1934), No. 5, pp. 454, 455*).—This note indicates the viability of the fungus in wood to be at least 10 yr. and in the sporophore at least 2 yr.

Sclerotinia wilt of Canada thistle, E. W. Bodine (*Phytopathology, 25 (1935), No. 10, pp. 963, 964, fig. 1*).—This note from the Colorado Experiment Station reports a wilting and dying of Canada thistle (*Carduus arvensis*) shown to be due to *S. sclerotiorum*. The use of this fungus for biological control of the thistle suggested itself, but its lack of full effectiveness and its wide host range threw it out of further consideration.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Wildlife (*U. S. Dept. Agr., Sec. Agr. Rpt., 1935, pp. 55–58*).—The importance of the conservation of wildlife, the effects of unwise drainage of marshland, the place of wildlife in the land-use problem, and the biological and economic problems relating to it are considered (E. S. R., 72, p. 650).

The mammals of Connecticut, G. G. Goodwin (*Conn. State Geol. and Nat. Hist. Survey Bul. 53 (1935), pp. 221, pls. 33, figs. 19*).—This publication provides information on the habits and distribution of the mammals native to Connecticut. The account is based on field work conducted by the author in Connecticut during the summers of 1928 and 1930, on collections in a number of museums and of the U. S. D. A. Bureau of Biological Survey, and on trappers' notes. Following introductory material and a classified list of mammals in Connecticut, they are considered in systematic order. A general description, measurements, geographical distribution, range and records in the State, and color are given for each form. A bibliography and indexes to Latin and common names are included.

The migration of North American birds, F. C. Lincoln (*U. S. Dept. Agr. Circ. 363 (1935), pp. 72, figs. 29*).—This contribution, which supersedes Bulletin 185 by Cooke (E. S. R., 33, p. 57), considers the mystery of migration, the time birds migrate, how they migrate, where they migrate, routes of migration, evolution of migration routes, vertical migration, vagrant migration, perils of migration, the influence of weather on migration, and the problems of migration. The contribution is presented with a list of 46 references to the literature and an index.

An epidemic among voles (Microtus agrestis) on the Scottish border in the spring of 1934, C. Elton, D. H. S. Davis, and G. M. Findlay (*Jour. Anim. Ecol., 4 (1935), No. 2, pp. 277–288, pl. 1*).—A discussion of an epidemic of encephalitis among voles in the Newcastleton area of southern Scotland, caused by a *Toxoplasma* invading the brain.

The gapeworm (Syngamus) in wild birds, J. W. Campbell (*Jour. Anim. Ecol., 4 (1935), No. 2, pp. 208–215*).—In the studies reported, the details of which are given in four tables, gapeworms morphologically identical with *S. trachea* Montagu were found in the carrion crow, rook, jackdaw, magpie, starling, house sparrow, purple sandpiper, and pheasant. Gapeworms identified as *S. merulae* Baylis occurred in the song thrush, redwing, and blackbird.

"Although the degree of infestation is lower in adult than in immature birds, adults are able to act as carriers of gapes. Young birds tend to free themselves from the worms as they get older. This confirms the conclusions of previous observers. Gapes is widely distributed among rooks, for young birds from eight different rookeries were found to be heavily infested. There is a tendency for *Syngamus* in starlings to be attached to the upper third of the trachea, and to the lower third in adult rooks and pheasants. Chickens were infested by feeding with earthworms obtained from a rearing field where pheasants had been reared."

An ectoparasite census of ducks and geese (Anatidae) in Uganda, G. B. Thompson (*Jour. Anim. Ecol., 4 (1935), No. 2, pp. 192–194*).—This contribution reports upon examinations of 97 birds representing 9 species of Anatidae, from which a total of 1,759 parasites were obtained. The details are given in two tables.

The reptiles of Connecticut, G. H. Lamson (*Conn. State Geol. and Nat. Hist. Bul. 54 (1935), pp. 35, pls. 12*).—In this contribution the snakes, lizards, and turtles of Connecticut are dealt with, their length, color, habitat, food, and breeding habits being recorded.

Effects of crude oil pollution on oysters in Louisiana waters, P. S. Galtsoff, H. F. Prytherch, R. O. Smith, and V. Koehring (*Bul. Bur. Fisheries [U. S.], 48 (1935), No. 18, pp. 143–210, pls. 2, figs. 18*).—Following an introduction by Galtsoff and Prytherch (pp. 144–146), preliminary field investigations, 1933, are considered by Prytherch (pp. 146–149); a survey of oyster bottoms in areas affected by oil well pollution, 1934, by Smith (pp. 150–157); experimental studies of the effect of oil on oysters (pp. 158–193), including a review of the literature by Galtsoff (pp. 158, 159), the survival of oysters in oil-polluted water by Prytherch (pp. 159–167), and the effect of oil on feeding of oysters by Galtsoff and Smith (pp. 167–193); and the effect of crude oil on diatoms, by Galtsoff and Koehring (pp. 193–204). A bibliography of 34 titles is included.

[Contributions on economic insects in Hawaii] (*Hawaii. Ent. Soc. Proc., 8 (1933), No. 2, pp. 247, 248, 253–264 279–297, figs. 20; 8 (1934), No. 3, pp. 395–468, 517, 518, 535–543, figs. 7*).—The contributions relating to insects of economic importance in Hawaii include the following: A Hibiscus Bud Midge New to Hawaii [*Contarinia maculipennis* n. sp.], by E. P. Felt (pp. 247, 248); Introduction to Hawaii of Malayan Parasites (Scelionidae) of the Chinese Grasshopper *Oxya chinensis* (Thun.), with Life History Notes, by C. E. Pemberton (pp. 253–264); The Causes of Fluctuations of Populations of Insects, by R. N. Chapman (pp. 279–297); Notes on Two Pests of Pineapple Not Known in Hawaii [*Metamasius ritchiei* Marsh, and *Thecla echion* (L.)], by W. Carter (pp. 395–397), contributed from the Hawaiian Pineapple Producers' Experiment Station; A Review of the Hawaiian Diptera, with Descriptions of New Species, by E. H. Bryan, Jr. (pp. 399–468), which includes a check list of the Diptera found in Hawaii; The Immunity of *Pseudococcus brevipes* (Ckll.) to Parasitism by *Coccophagus gurneyi* Compere, by C. T. Schmidt (pp. 517, 518), contributed from the Hawaiian Pineapple Producers' Experiment Station; and Notes on the Habits and Life History of *Sciara molokaiensis* Grimshaw, a Serious Pest of the Roots of Plants in Hawaii (Mycetophilidae) (pp. 535–539) and Life History and Habits of *Apelma brevis* Johannsen (Chironomidae) (pp. 541–543), both by J. F. Illingworth.

[Contributions on economic insects] (*9. Cong. Far East. Assoc. Trop. Med., Nanking, China, 1934, Trans., vols. 1, pp. 503–506, pl. 1, figs. 3; 2, pp. 201–232, 807–812, pls. 7, figs. 6*).—The contributions presented at the ninth congress of the Far Eastern Association of Tropical Medicine held at Nanking, China, in October 1934 include the following: A Device for the Eradication of Bedbugs, by T. M. P'eng and W. W. Yung (pp. 503–506); Anti-Mosquito Measures in the Northern Settlement of Malaya, by J. W. Scharff (pp. 201–212); Antilarval

Measures by the Use of Paris Green in a Selected Area of Nanking, by Y. T. Yao and C. C. Wu (pp. 213–221); The Automatic Distribution of Paris Green for Control of *Anopheles* Larvae, by P. F. Russell (pp. 223–232), and The Temperature Factor in the Efficacy of Sodium Cyanide as a Larvicide, by E. Landauer (pp. 807–812).

The locomotion of animals.—I, The flight of insects, A. Magnan (*La Locomotion chez les animaux.—I, Le Vol des insectes. Paris: Hermann & Co., 1934, pp. 186, pls. 36, figs. 209*).—This account of the mechanics of insect flight is illustrated by many text figures and several series of film-strip photographs. A list of 65 references to the literature is included.

Studies of fluctuations in insect populations, V, VI, H. F. Barnes (*Jour. Anim. Ecol., 4 (1935), No. 2, pp. 244–253, fig. 1; 254–263*).—Part 5 of this contribution from the Rothamsted Experimental Station (E. S. R., 74, p. 71) deals with the leaf-curling pear midge *Dasyneura pyri* Bouché. The parasite *Misocyclops marchali* Kieff. is recorded as attacking the second and ensuing broods of the midge but in no case the first brood.

The sixth and concluding part is devoted to a discussion of the results of the series of studies.

Status of sugarcane insect pests during 1934 and 1935, J. W. Ingram (*Sugar Bul., 14 (1935), No. 3, pp. 3, 4*).—This contribution reports briefly on the abundance of insect pests in 1934 and 1935 and outlines the various problems being investigated by the U. S. Department of Agriculture.

The enemies of the grape and their control in Algeria.—I, The animal parasites, M. Delassus, A. Lepigre, and R. Pasquier (*Les Ennemis de la vigne en Algérie et les moyens pratiques de les combattre.—Tome I, Les Parasites animaux. Alger (Algiers): Jules Carbonel, 1933, vol. 1, pp. VIII+249, figs. 115*).—This first part deals with the insect, nematode, and mite enemies of the grape and means for their control.

Review of United States patents relating to pest control, [January–December 1935], R. C. Roark (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., Rev. U. S. Pat. Relat. Pest Control, 8 (1935), Nos. 1, pp. 10; 2, pp. 11; 3, pp. 10; 4, pp. 12; 5, pp. 10; 6, pp. 8; 7, pp. 11; 8, pp. 10; 9, pp. 13; [10], pp. 10; 11, pp. 10; 12, pp. 9*).—A continuation of this review (E. S. R., 72, p. 808).

Dusting cranberry bogs from the air, C. S. Beckwith (*Amer. Cranberry Growers' Assoc., Proc. Ann. Conv., 66 (1935), pp. 14–16*).—Contributing from the New Jersey Experiment Stations, the author reports that air machines, used on a number of bogs, have shown great promise. The autogiro is said to have given an excellent kill with 30 lb. of pyrethrum to the acre, and seemed to force the pyrethrum dust through the vines more effectively than the airplane. Where pyrethrum dust and clay mixture is used the autogiro is also more effective than the airplane.

The problem of the evaluation of rotenone-containing plants.—I, Derris elliptica and Derris malaccensis, F. Tattersfield and J. T. Martin (*Ann. Appl. Biol., 22 (1935), No. 3, pp. 578–605, figs. 9*).—In work at the Rothamsted Experimental Station seven samples of *Derris* root were examined chemically for the following determinations: Rotenone (crude and recrystallized), ether extract, methoxyl content, and dehydro compounds. Insecticide tests were carried out and comparisons made between pairs of samples tested on the same day. When comparisons were made between pairs belonging to different species of *Derris*, the determinations of rotenone by the present methods, ether extract or methoxyl content, did not express accurately the relative insecticidal potencies of the pairs of samples. When comparisons were made between pairs of the same species, all these determinations appeared to give a closer measure of their relative activities. The estimation of the dehydro compounds, or of rotenone plus the dehydro compounds in the resin, gave a better assessment of the relative potencies than the other determinations whether comparisons were made between samples of the same or of different species.

The standardisation of petroleum and tar oils and preparations as insecticides, H. Martin (*Ann. Appl. Biol., 22 (1935), No. 2, pp. 334–414, fig. 1*).—This contribution from the Long Ashton Research Station, England, deals with the subject under the headings of petroleum oils, tar oils, combined tar-petroleum oil preparations, the status of certain oils and preparations under the proposed specifications, analytical methods, and evidence in support of proposed methods of analysis. A list of 76 references to the literature is included.

The compatibility of pyrethrum insecticides with bordeaux mixture, C. Doehlert (*Amer. Cranberry Growers' Assoc., Proc. Ann. Conv., 66 (1935), pp. 6–10*).—Laboratory tests at the New Jersey Experiment Stations with the apple aphid have shown that both alcoholic and kerosene extracts of pyrethrum may be used in combination with bordeaux mixture without deterioration of the pyrethrins if Penetrol is used as a spreader and sticker. If rosin-fish oil soap is used as a spreader and sticker, the deterioration of the pyrethrins begins immediately and appears to become complete within 2 hr.

In less extensive tests with the blunt-nosed leafhopper (*Euscelis striatulus* Fall.), the effectiveness of bordeaux, kerosene extract, and Penetrol was confirmed, but one-third more pyrethrum was needed in this mixture to equal the same spray without bordeaux.

Details of the tests are given in two tables.

The comparison of dosage-mortality data, C. I. Bliss (*Ann. Appl. Biol., 22 (1935), No. 2, pp. 307–333*).—The subject is dealt with under the headings of (1) measuring the agreement between dosage-mortality data and (2) estimating dosage from a standard curve.

The role of fungi in the diet of the common damp-wood termite Zootermopsis angusticollis, E. C. Hendee (*Hilgardia [California Sta.], 9 (1935), No. 10, pp. 499–525, figs. 8*).—The common damp-wood termite *Z. angusticollis* (Hagen), associated in nature with an abundant and varied fungus flora, was fed individually and in groups on various fungus-containing and fungus-free diets.

The results indicate that fungi (*Trichoderma lignorum*) play an essential role in the natural diet of *Z. angusticollis.* "The fungi offer a source of proteins. They probably supply vitamins which are essential to the normal growth and development of termites. Through the secretion of extracellular enzymes they may render the wood itself more available. It is not known what effect the fungi may have on harmful extractives in the wood. On the diet of fungus-free, sound wood mortality of termites was even higher during the early part of the experimental period than on the more deficient diet of filter paper, while on sound wood on which a growth of fungus had developed viability was good. Whether the termites survived because they were better nourished, or because the fungi had rendered some toxic substance in the wood harmless, or because of both factors, is uncertain. It is certain, however, that the differential factor was the presence of the fungus."

Orthoptera of the Japanese Empire, I, II, T. Shiraki (*Insecta Matsumurana, 4 (1930), No. 4, pp. 181–252, figs. 24; 5 (1931), No. 4, pp. 171–209, figs. 20*).—Part 1 of this work on the Orthoptera deals with the Gryllotalpidae and Gryllidae (pp. 181–252), and part 2 with the Blattidae (pp. 171–209).

Orthoptera of the Japanese Empire.—III, Fam. Mantidae, T. Shiraki (*Formosa [Taiwan] Nat. Hist. Soc. Trans., 22 (1932), No. 120, pp. 113–123*).—This is a continuation of the above work.

Orthoptera of the Japanese Empire.—IV, Phasmidae, T. Shiraki (*Mem. Faculty Sci. and Agr., Taihoku Imp. Univ., 14 (1935), No. 3, pp. 23–88, pls. 7, figs. 9*).—This fourth part of the work above noted includes a list of 62 references to the literature.

Control of pumpkin bugs in citrus groves, J. R. Watson (*Citrus Indus., 16 (1935), No. 9, pp. 8, 9*).—This is a practical account of means of control of the southern green stinkbug, referred to by citrus growers as the "pumpkin bug."

Insect injury simulating fungal attack on plants: A stem canker, an angular spot, a fruit scab, and a fruit rot of mangoes caused by Helopeltis bergrothi Reut. (Capsidae), R. Leach (*Ann. Appl. Biol., 22 (1935), No. 3, pp. 525–537, pls. 2, figs. 3*).—In a contribution from the Department of Agriculture, Nyasaland, four different types of disease of the mango tree are shown to be caused by the capsid bug *H. bergrothi*. Symptoms of a stem canker, an angular leaf spot, a fruit scab, and a fruit rot of mangoes are described, and an account is given of the morbid anatomy of these diseases. References to control measures advocated against *H. bergrothi* are cited. The importance of further cooperative work between entomologists and mycologists in the study of plant diseases is emphasized.

Studies on the secretion of diastase and invertase by Empoasca solana Delong (Rhynchota, Homoptera, Jassidae), G. V. B. Herford (*Ann. Appl. Biol., 22 (1935), No. 2, pp. 301–306*).—The study reported has shown that adults and nymphs of *E. solana* are able to eject diastase into the feeding medium. This diastase, besides being secreted in the salivary glands, is apparently also formed by certain yeasts which are regurgitated from the gut of the insects. A technic is described for feeding the leafhoppers on a liquid. The insects have also been shown to be capable of secreting an enzyme, probably invertase, which has the power of inverting pure sucrose.

A preliminary report on the studies of certain diseases of cotton.—I, Studies of the cyrtosis, S. C. Teng (*Sci. Soc. China, Biol. Lab. Contrib., Bot. Ser., 6 (1931), No. 9–10, pp. 117–126*).—Studies of a disease of cotton in China, first described by Cook in 1920 (E. S. R., 43, p. 446) and named cyrtosis or club leaf, and shown by S. C. Wang and H. Yuan in 1924[5] to be associated with the leafhopper *Chlorita biguttula* Mats., are reported upon. The application of bordeaux mixture as a repellent was found to protect plants from the disease, and used weekly starting from the time the leafhoppers began to appear and ending at the time when the cotton plants ceased to form additional flowers it gave an increase in yield of from 20 to 30 percent. It is pointed out that late planting should be avoided, and that other food plants of the leafhopper in the vicinity of cotton fields should be destroyed.

Chemical treatments for the control of the cyrtosis of cotton, S. H. Ou (*Sinensia, 5 (1934), No. 5–6, pp. 480–483*).—In the experiments conducted in continuation of those by Teng above noted, five applications of bordeaux mixture (5–5–50) during the season actually increased the yield of cotton, due to less severe development of cyrtosis, from 11.3 to 35 percent. With copper-lime dust the increase in yield was from 9.5 to 15 percent.

Further experiments on the artificial feeding of Myzus persicae (Sulz.), M. A. Hamilton (*Ann. Appl. Biol., 22 (1935), No. 2, pp. 243–258, fig. 1*).—From the Rothamsted Experimental Station, a method is described for the feeding of the green peach aphid on media of which one constituent is a radioactive indicator containing polonium. The results show that the aphid picks up the indicator from the medium and transmits it to a leaf on which it is subsequently fed. The volumes imbibed are of the same order of magnitude as those imbibed by aphids under natural feeding conditions. A constant proportion of the amount imbibed is transferred to the leaf, from which it is deduced that the polonium is transmitted through the bodies of the aphids and not on the outsides of the stylets. Evidence is given to show that the virus probably behaves in the same way as the polonium.

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[5] Natl. Southeast. Univ., Cotton Res. Lab. Rpt., 1924, pp. 1–28.

Studies on aphides infesting the potato crop.—IV, Notes on the migration and condition of alate Myzus persicae Sulz., W. M. DAVIES and T. WHITEHEAD (*Ann. Appl. Biol., 22 (1935), No. 3, pp. 549–556*).—In a continuation of earlier studies (E. S. R., 73, p. 814), field observations have shown that winged migrants are the main source of the initial infestation of the green peach aphid on the potato crop. They arrive in quantity during June and July from various cruciferous plants on which they have hibernated or to which they migrate in early spring. The proportion of alate aphids was found to be much higher in a district where virus infection of the stocks had been rapid, compared with a district where such was negligible. The proportion of migrating alate green peach aphids infected with virus diseases in a district where the spread is rapid proved to be particularly small. In 81 experiments involving 1,178 alatae only four instances included vectors, possibly only a single vector in each of the four experiments.

It is concluded that the introduction of virus diseases into a healthy stock by migrating alatae is slight, but this small amount is subsequently spread by apterous forms moving within the crop.

Mass action phenomena in mealybug wilt, W. CARTER and C. T. SCHMIDT (*Ann. Ent. Soc. Amer., 28 (1935), No. 3, pp. 396–403, figs. 2*).—In a study made at the Hawaiian Pineapple Producers' Experiment Station of the relationship between numbers of pineapple mealybugs applied and resulting wilt of pineapple plants, 3,130 plants were infested with mealybugs varying in number from 1 to 40. Check plants to the number of 3,151 were also observed.

It was found that "the separation of mass action phenomena from those of incidence of toxic individuals by statistical methods is difficult, but wilt in the plats infested with one mealybug per plant was not statistically significant when compared with that developing in the check plats. From this it is concluded that under the conditions of plant susceptibility prevailing at the time, the most susceptible plant required a toxic dose greater than that provided by the feeding of one mealybug.

"The biology of the insect and field observations on its occurrence provide additional evidence against the hypothesis that wilt is the result of the incidence of toxic individuals. The datum on the factor of mass action is indicative, but other experimental approaches will be necessary before this factor can be adequately evaluated."

The camphor scale, A. W. CRESSMAN and H. K. PLANK (*U. S. Dept. Agr. Circ. 365 (1935), pp. 20, figs. 7*).—A practical summary of information is given on the biology and control of the camphor scale, an introduced pest of fruit and shade trees and ornamental plants in the Gulf Coast region, it being generally distributed in southern Louisiana with isolated infestations occurring in Mississippi, Alabama, and Texas. The scale has been found on nearly 200 host plants, a list of which is included. The minimum time required to complete a generation is 51 days. There are three complete generations a year, and in some years a partial fourth brood may develop. Insect enemies and fungus diseases are listed, but natural enemies cannot be relied upon to control the scale. Control can be obtained by spraying with emulsions of petroleum oil. For dormant sprays, 2.5 to 3 percent of oil should be used, while summer applications should contain 1 to 1.2 percent of oil. Directions are given for timing applications to secure maximum effectiveness. Fumigation with hydrocyanic acid gas is also an effective means of control for nursery stock and many greenhouse plants. A dosage schedule is given for this treatment.

A list is given of 17 references to the literature.

The Florida wax-scale (Ceroplastes floridensis (Comst.)) in Palestine, F. S. Bodenheimer (*Hadar, 8 (1935), No. 7, pp. 187–191, 195, fig. 1*).—Studies of the biology, economic importance, and control of the Florida wax scale are reported upon.

Prompt treatment necessary for Holcocera control, A. J. Basinger and A. M. Boyce (*Citrus Leaves, 15 (1935), No. 9, pp. 7–9*).—This is a practical discussion of the orange worm control problem, with formulas and directions for the application of sprays and dusts, based upon investigations at the California Citrus Experiment Station (E. S. R., 73, p. 655).

Observations on spray injury and codling moth control, W. C. Dutton (*Amer. Pomol. Soc. Proc., 50 (1934), pp. 10–12*).—A brief practical discussion, presented at the annual convention of the American Pomological Society held at Grand Rapids, Mich., in December 1934.

Control of iris borer (Macronoctua onusta Grote), E. I. McDaniel (*Michigan Sta. Quart. Bul., 18 (1935), No. 2, pp. 92–94, fig. 1*).—The results of a series of experiments with insecticidal treatments for control of the iris borer, carried on in several iris fields and under different conditions, are reported in tabular form.

Treatment with liquids applied to rhizomes protected by earth dikes failed to kill the borer. Crystals of paradichlorobenzene applied to rhizomes covered with an inch or more of dry sand killed many larvae and pupae when applied at the rate of 1 oz. per square foot, but a smaller amount of the chemical was ineffective. Plants treated with paradichlorobenzene in oil applied with a brush to the openings of the borer tunnel were burned, and no kill resulted among either the iris borer or the lesser bulb fly. Where calcium cyanide was used at the rate of 1 oz. per square foot, "the larvae and pupae of the iris borer were killed as well as the larvae of the lesser bulb fly. There was no injury to the plant where the rhizomes were covered with dry sand before applying the calcium cyanide, but where the chemical came in contact with the naked rhizome burning resulted. Best results were obtained when the calcium cyanide was covered with a light layer of sand as soon as it was applied. Where the dosage was reduced to 0.5 oz. per square foot, the kill was not satisfactory."

The only satisfactory results obtained in the series of experiments conducted were those with calcium cyanide, with which, if applied with the precautions pointed out, no injury to the plants followed.

The technic of handling mosquitoes, P. F. Russell and F. E. Baisas (*Philippine Jour. Sci., 56 (1935), No. 3, pp. 257–294, pls. 8, figs. 12*).—Methods employed in work with mosquitoes are dealt with.

The genus Tabanus in Utah, J. A. Rowe and G. F. Knowlton (*Canad. Ent., 67 (1935), No. 11, pp. 238–244, figs. 10*).—Contributing from the Utah Experiment Station a key is given to the species of *Tabanus* occurring in the State, together with notes on 15 species and a description of the new species *T. utahensis*.

North American two-winged flies of the genus Doryphorophaga (Tachinidae, Diptera), H. J. Reinhard (*Jour. N. Y. Ent. Soc., 43 (1935), No. 4, pp. 387–394*).—This synopsis, with a key to the six species of the genus *Doryphorophaga*, includes descriptions of four that are new, namely, *D. australis* reared at College Station, Tex., from the Colorado potato beetle and *Leptinotarsa defecta* Stal., *D. macella* collected from several localities in Texas and also in Ohio, Iowa, and Michigan, *D. sedula* from Ohio and Texas, and *D. patrita* from Ohio.

Sheep blowfly investigations, I, II (*Ann. Appl. Biol., 22 (1935), No. 2, pp. 279–300, fig. 1*).—Two papers are presented.

I. *The relationship of humidity to blowfly attack*, W. M. Davies and R. P. Hobson (pp. 279–293).—The results obtained in the first of a series of studies dealing with various aspects of the sheep maggot problem, especially the causes of susceptibility, are briefly summarized as follows:

"The eggs and young larvae of *Lucilia sericata* Mg., the sheep maggot fly, are extremely sensitive to desiccation at 37° C. Dry conditions prevail in the fleece near the skin, except in the region of the rump, and the relative humidity seldom exceeds 70 percent, even during wet weather. These results show that the microclimate at the base of the wool is normally too dry for the development of maggots. This has been confirmed by finding desiccated eggs and larvae on sheep in the field. Sheep do not become infested with maggots unless predisposing conditions are present. The humidity at the base of the wool appears to be the main factor which determines susceptibility. The wool around the rump is often moist owing to soiling with feces and urine, the humid conditions favoring the development of eggs and maggots."

II. *Substances which induce Lucilia sericata Mg. to oviposit on sheep*, R. P. Hobson (pp. 294–300).—Various putrefying substances to which other blowflies did not respond were found to attract *L. sericata* to oviposit on sheep in the field. Excreta of *Lucilia* larvae are extremely attractive. Feces from scouring sheep, stale urine, and bacterial cultures are also effective. *Lucilia* does not oviposit on these substances unless they are placed close to the skin of a live sheep. Neither sheep skin, wool, nor other live animals can take the place of sheep. The attraction is not due to chemical or bacterial changes in the fleece, since actual contact with the skin or wool is not necessary. It is therefore concluded that the sheep itself plays an essential part in attracting *Lucilia*. The natural odor may be responsible. These results are discussed in relation to the origin and control of sheep strike.

Notes on the timothy grass flies (Amaurosoma spp.), H. F. Barnes (*Ann. Appl. Biol., 22 (1935), No. 2, pp. 259–266*).—From the Rothamsted Experimental Station, a brief account is given of the systematic position of the timothy flies *A. armillatum* Zett. and *A. flavipes* Fall., and the literature is reviewed. Their distribution is stated and notes are given on their bionomics as observed at Harpenden on material obtained from Slough, Buckinghamshire. The parasites *Microbracon exhilarator* Nees and *Lamprotatus* sp. are recorded.

Efforts made to see whether the earliness or lateness of timothy grass strain has any effect on the incidence of attack gave indications that a dwarf strain which is an early one is less liable to attack, but this may be due to a varietal resistance rather than to the time of flowering. It does not appear feasible to get limits of flowering wide enough to cover the period of attack, so that further investigations in this direction need not be pursued. Indications were obtained that the effect of manuring the grass may be to lower the attack, but further work in this direction is required.

A list is given of 24 references to the literature.

Observations on the timothy grass fly (Amaurosoma armillatum Zett.), L. A. L. King, A. A. Meikle, and A. Broadfoot (*Ann. Appl. Biol., 22 (1935), No. 2, pp. 267–278, figs. 2*).—A type of damage to the inflorescence of timothy grass is described which appears to be widely distributed and which has been found in the west of Scotland to be due to *A. armillatum*. Information is given as to occurrence in the field, method of attack on the plant, life history, and characteristics of the insect in its different stages. Three larval instars are distinguished, and the life history is noted as monocyclic. Two hymenopteran parasites are recorded. Experiments are described which were designed to test possible methods of control (1) by soil treatment and (2) by deterrents. Of the latter an emulsion of crude naphthalene in peanut oil is recommended as promising. It is suggested that the grass to be reserved for seed should be set apart early in the season and sprayed with this fluid at a time as near as possible to that of the egg laying.

A note on preliminary work on attractants for cabbage root fly (Hylemyia (Chortophila) brassicae Bche.) and carrot fly (Psila rosae L.), J. E. M. Mellor and R. M. Woodman (*Ent. Mo. Mag., 3. ser., 21 (1935), No. 251, pp. 258, 259*).—In observations of the attractiveness of materials, made of a limited number of insects, yeast appeared to be by far the most attractive to the cabbage maggot and the seed-corn maggot, followed by allyl mustard oil and glycine. Hexachlorethane alone attracted *Anthomyia pluvialis*. No carrot rust flies were taken by any of the traps.

Preliminary studies on the diseases of larvae of the Japanese beetle (Popillia japonica Newm.), I. M. Hawley and G. F. White (*Jour. N. Y. Ent. Soc., 43 (1935), No. 4, pp. 405–412*).—The diseases of Japanese beetle larvae cause a high mortality, sometimes reaching 50 percent of the larvae used for experimental work. These diseases are classified from gross appearance into three groups, namely, the black group, the white group, and the fungus group. The majority of the dead larvae found in the field belong to the black group, but the cause of the disease or diseases of this group is not known. It is thought that only one disease is present in the larvae of the white group, the tissues of the sick and dead larvae being filled with a micro-organism in pure or nearly pure culture which is probably the causal agent. The infectiousness of the disease or diseases of the larvae of the fungus group has not yet been determined.

"The disease among larvae in the present infested area varies greatly from year to year and at different times during the year. Disease is usually highest in May or June just before pupation and lowest when the new brood appears in July. Larval surveys in 1933 and 1934 show no consistent relationship between the extent of disease and the age of infestation or density of the larval population."

Fumigation of fresh fruit to destroy the adult Japanese beetle, M. R. Osburn and J. W. Lipp (*U. S. Dept. Agr. Circ. 373 (1935), pp. 30, figs. 18*).—The necessity for marketing a portion of the raspberry, blackberry, and blueberry crop outside the quarantine area in New Jersey, where these fruits are extensively grown, led to the fumigation experiments here reported.

Preliminary tests commenced in 1928 indicated that carbon disulfide is very effective in destroying the beetles. Fumigation of the fruit in an airtight room, using 10 lb. of the chemical per 1,000 cu. ft. for 2 hr. with a temperature of 80° F., gives a complete kill of the beetles, both in baskets of fruit and when exposed directly to the action of the vapor. Blueberries that were treated with this dosage were found to be slightly inferior to untreated fruit, but all the treated fruit of the other varieties was normal in appearance, flavor, and keeping qualities. Samples of blackberries analyzed immediately after being taken from the fumigating room in no case showed an absorption of carbon disulfide in excess of 2 p. p. m. of fruit.

Experiments with ethylene oxide indicated that a complete kill of beetles resulted from a 2-hr. exposure to 2 lb. of chemical per 1,000 cu. ft. at 75°. Blackberries exposed to this treatment were apparently uninjured, while treated blueberries were slightly inferior to untreated ones.

A description of the fumigating house used, a discussion of the operation of commercial fumigating houses, and details of fumigating under commercial conditions are included.

Since refrigerator cars loaded in Philadelphia with green bananas for distant points outside the quarantine area are subject to infestation during the period that the Japanese beetle is abundant, work was also conducted with this fruit. Attempts that were made to screen the passage between the fruit boat and the cars proved unsuccessful. Severe injury occurred to bananas exposed to 2 lb. of ethylene oxide under the conditions indicated. All beetles were killed by an exposure to 3 lb. of calcium cyanide (50 percent cyanogen) per refrigerator car of 2,600-cu. ft. capacity, for 1.5 or 2 hr., with an initial temperature of 80° inside the car. The powdered chemical was spread in paper-lined wooden trays placed on top of the fruit.

"Tests with a number of compounds which produce hydrocyanic acid gas indicated that toxicity to Japanese beetle grubs is dependent on the amount of hydrocyanic acid gas produced and the rapidity of its evolution, under similar conditions of exposure and temperature. The compounds showing the highest degree of toxicity were those containing liquid hydrocyanic acid absorbed in diatomaceous earth or in wood paper pulp.

"Tests with liquid hydrocyanic acid showed that both grubs and adult beetles can be killed by a 2-hr. exposure to 6 oz. of the chemical per refrigerator car, the temperature inside the car being 75° at the start of the treatment. The liquid is introduced from a portable drum into containers placed on the rack in the ice compartment at each end of the car.

"The costs for calcium cyanide and hydrocyanic acid are approximately $3.45 and $0.37 per car, respectively. The amount of hydrocyanic acid absorbed by the bananas is not more than 10 p. p. m., practically all of which has disappeared 5 days after fumigation. Bananas were injured by dosages of 5 lb. of hydrocyanic acid per 1,000 cu. ft. However, no injury to fruit when fumigated with the recommended amount (6 oz. per car) has been reported."

Movements of larvae of the oriental beetle through soil, H. C. Hallock (*Jour. N. Y. Ent. Soc., 43 (1935), No. 4, pp. 413–425, figs. 5*).—This contribution deals with the vertical and horizontal movements of the larvae of the Asiatic beetle and some of the biological and environmental influences which affect these movements, based on studies in Nassau County, N. Y., during the seasons 1927–33.

"Larvae of the oriental beetle have been found to move downward in the soil to depths of from 8 to 17 in. when the soil temperature at the 3-in. level has reached 50° F. In the spring after hibernation the return upward starts at a soil temperature of about 43° and is completed at 50°.

"Oviposition by the oriental beetle takes place at depths of 1 to 11 in. Larvae temporarily move deeper in the soil just before changing from one instar to the following instar or stage. Larvae are usually found deeper in cultivated ground than in grass sod. This is often due to a smaller amount of soil moisture at the surface in the former situations.

"There is good evidence that larvae move horizontally in the soil. In large field cages some larvae moved approximately 4 ft., and there was little difference in the extent of the movement as influenced by the presence or absence of wheat as food. Field observations indicate that larvae feed on the roots of plants until they are killed and then move on to other plants. The extent of the outward movement depends to some extent on the decomposed material in the soil that is available as food."

Insects as carriers of Clostridium botulinum, M. F. Gunderson (*Jour. Bact., 30 (1935), No. 3, p. 333*).—In studying an epizootic of botulism in the least sandpiper, it was found that large areas of Tule Lake, Calif., were covered by a mat of algae of the genus *Cladophora*, the surface of which was dotted with large numbers of cocoons that had been formed by the hydrophilid water beetle *Enochrus hamiltoni* Horn by felting together masses of the *Cladophora* filaments. It was observed that the epizootic among sandpipers occurred when this beetle was in the larval stage, and that it lasted for a week or 10 days. Large numbers of the beetle larvae were found in the stomachs of both sick and normal sandpipers, *C. botulinum* type C having been demonstrated in cultures made from the larvae and also from the cocoons. When the insect was in the pupal and adult stages, sandpipers did not represent any great portion of the affected bird population.

It is concluded that the moist algal basket containing dead and putrefying larvae undoubtedly constituted the source of toxin for sandpipers.

On the biology of Araecerus fasciculatus De Geer (Col., Anthribidae), with special reference to the effects of variations in the nature and water content of the food, M. Taher El Sayed (*Ann. Appl. Biol., 22 (1935), No. 3, pp. 557-577, figs. 4*).—This is a report of a study on an anthribid beetle of considerable economic importance as a pest of stored products, presented with a list of 29 references to the literature.

The effect of high temperature on the confused flour beetle, M. J. Oosthuizen (*Minnesota Sta. Tech. Bul. 107 (1935), pp. 45, figs. 11*).—Part 1 of this contribution reports upon the death rate of the several stages of the confused flour beetle when exposed to temperatures above 89.6° F. (pp. 4-26), and part 2 upon the influence of such temperatures upon the fecundity and fertility of adults (pp. 27-41).

It was shown that at 105° the eggs of this insect are killed in less than 3 days. At a temperature no higher than 100° there is a considerable reduction in the percentage of eggs that will hatch. "The average hatch of eggs of *Tribolium confusum*, laid at 32° C. [89.6° F.] and kept at that temperature, was 88.5 percent, whereas for eggs from the same lot kept at 37.5° to 38.5° it was only 64.0 percent. When adults were kept at 37.5° to 38.5°, the percentage of eggs hatching was reduced until for eggs laid on the twelfth day it was 40.1 percent.

"Whether adults would be completely sterile if kept at this temperature permanently was not determined. Larvae can develop at 37.5° to 38.5°, although the developmental rate is definitely slower than at 32°. Nearly all the female adults developing from them, however, were found completely sterile, whereas, with few exceptions, the fertility of the males was unaffected." The pupa is the stage most resistant to heat. Exposure to high temperatures produces varying degrees of sterility in female beetles, depending upon the temperature and the length of exposure. "Complete sterility of females induced by heat is of considerable economic importance in the control of the species, since, apart from an inability to produce any progeny, the adult longevity is also reduced. Sterility induced by heat in males of the confused flour beetle is of no apparent economic importance, since, apart from being much less affected than the females, 1 male has been shown to be capable of fertilizing 36 virgin females in 3 days."

Reference is made to the literature, a list of 63 references to which is included.

Sterilization of Tribolium by high temperature, T. Park (*Science, 82 (1935), No. 2125, pp. 281, 282*).—A rise from 28° to 39° C. within a period of about 5 hr. in the incubator in which the confused flour beetle, mostly in the third and fourth of the 7 or 8 larval stages (or about midway in its metamorphosis), was kept failed to kill a single individual. The pupae that formed therefrom produced adults without atypical mortality. Records of oviposition, however, furnished evidence of sterilization by high temperatures.

Bollweevil control with calcium arsenate on field plots in Madison Parish, La., from 1920 to 1934, M. T. Young (*U. S. Dept. Agr., Tech. Bul. 487 (1935), pp. 24, figs. 3*).—The results of field plat tests aimed at the determination of the effectiveness of calcium arsenate dustings for the control of the bollweevil, conducted in Madison Parish, La., over a period of 15 yr., are reported upon, the details being given in table and chart form.

"The average annual increase in yield per acre for the plats dusted with calcium arsenate ranged from 10 lb. in 1924 to 742 lb. in 1926, with an average for the 15-yr. period of 356 lb., or 30.2 percent. The difference in the square infestation of the treated and the untreated plats and the increase in yield in the treated plats were greatest in those years when the infestation was the heaviest. In the years when it was necessary to start treatments early in the season more applications were required than in the years when treatments were started later.

"Tests made in 1920 on early, intermediate, and late infestations showed that, although more applications were required for control, greater increases in yields were made in the plats where the infestations began early in the season. With later infestations more cotton was produced than in the early infestations in both treated and untreated plats.

"Tests conducted in 1927 on cotton planted at the usual time on unflooded land and planted late after floodwaters had receded from the fields indicated that weevils emerging from hibernation concentrated in the older cotton, and that the younger cotton did not become heavily infested until weevils migrated from the older cotton. The concentration of migratory weevils was more pronounced in the western portion of Madison Parish in fields located nearer to unflooded hill land than in the eastern portion of the parish.

"Tests conducted in 1928 showed a greater weevil infestation in the untreated plats, and greater increases in yields in the treated plats, in cotton fields where cotton had been grown than in fields where cotton had not been grown in 1927.

"Two special control tests in 1932 on cotton, growing in very fertile land, which continued to fruit unusually late in the season, showed that the bollweevil could be controlled by calcium arsenate dusting and good gains made when the square infestation was very high and while field migration was in progress."

A method of reclaiming severely weeviled white pine plantations, A. C. Cline and H. J. MacAloney (*Mass. Forestry Assoc. Bul. 152 [1931], pp. 12, figs. 3*).—The method described, for use in a seriously injured plantation, includes the pruning of the lower branches of 200 to 300 per acre of the least injured trees and girdling to remove competing trees.

Additional notes on the improvement of weeviled white pine plantations, A. C. Cline and H. J. MacAloney (*Conn. Forest and Park Assoc. Pub. 24 [1933], pp. 11, figs. 4*).—This contribution supplements the earlier account noted above.

Progress report of the reclamation of severely weeviled white pine plantations, A. C. Cline and H. J. MacAloney (*Jour. Forestry, 33 (1935), No. 11, pp. 932–935, fig. 1*).—Observations of the method of reclaiming severely weeviled white pine plantations which was developed in 1930, as noted above, have shown the pruned trees to be recovering. Most of the girdled trees are said to have died, and the stand has been opened gradually. The method is considered to have worked out satisfactorily.

"Purple brood" of bees, C. E. Burnside (*Gleanings Bee Cult., 63 (1935), No. 12, pp. 717, 718*).—A disorder of bees met with in the Southern States, characterized by the death of brood from May to July and a pronounced purple or blue color in many of the affected larvae, appears to be due to the nectar or pollen of *Cyrilla racemiflora*, locally known as southern leatherwood, black titi, red titi, summer titi, and he-huckleberry.

A list of the ants of Oklahoma (Hymen.: Formicidae), M. R. Smith (*Ent. News, 46 (1935), Nos. 9, pp. 235–241; 10, pp. 261–264*).—An annotated list is given of 66 ant forms, including the localities collected, in Oklahoma.

Habits of North American digger wasps of the genus Sphex, C. H. Hicks (*Colo. Univ. Studies, 23 (1935), No. 1, pp. 29–31*).—An abstract is given of a thesis on the digger wasps of the genus *Sphex*, which generally, and probably without exception, nest in the soil. Their prey, consisting of lepidopterous larvae, is stung to inertness in capture and later stored in the cell as food for the wasp's young, the egg being fixed to the side of the first prey taken. The studies have contributed to the knowledge of the habits or biology of 13 species.

The spider prey of the mud wasp Sceliphron caementarium (Araneae, Hymen.: Sphegidae), P. Rau (*Ent. News, 46 (1935), No. 10, pp. 267–270*).—A list is given of spiders that the mud dauber *S. caementarium* is known to hunt and store in its nest as food for its young.

The wasp Chalybion cyaneum Fab. preys upon the black widow spider (Latrodectus mactans Fab.) (Hymen., Araneae), P. Rau (*Ent. News, 46 (1935), No. 10, pp. 259, 260*).—The author has found *C. cyaneum*, known as the cuckoo bird wasp, to hunt, sting, and store *L. mactans* in its nests as food for the young.

New ichneumon-flies, R. A. Cushman (*Jour. Wash. Acad. Sci., 25 (1935), No. 12, pp. 547–564, fig. 1*).—In this contribution the genus *Oocenteter* is erected and 13 species are described as new, including the following: *Phaeogenes epinotiae*, reared from *Epinotia nanana* Treitsch. and *Recurvaria piceaella* Kearf. at Georgetown, Maine; *Lissonota recurvariae* and *Neliopisthus piceae*, both reared from *R. piceaella*, the former at Bristol and the latter at Southport, Maine; *O. tomostethi* and *Perilissus tomostethi*, both reared from *Tomostethus multicinctus* Roh., the former at Riverdale, Md., and the latter at Boston, Mass.; *Phaedroctonus epinotiae*, reared from *E. nanana* at Bristol, Maine; *P. temporalis*, reared from *Laspeyresia youngana* Kearf. at Groton, Vt.; *P. piceae*, reared from *R. piceaella* and *E. nanana* at Georgetown, Maine; *Cremastus grapholithae*, reared from the oriental fruit moth at Harriman, Tenn.; *C. chilonis*, reared from *Chilo forbesellus* Fern. at Douglas Lake, Mich.; and *C. protractus*, reared from *Coleophora* sp. on *Aster eatoni* at Pullman, Wash.

Notes are included on several additional forms of economic importance.

Some observations upon the "red spider", Tetranychus telarius L., on hops and its control, with notes on some predatory insects, S. G. Jary (*Ann. Appl. Biol., 22 (1935), No. 3, pp. 538–548*).—The treatment in November of soil around hops in Kent with crude naphthalene at the rate of 300 lb. per acre did not prevent infestation by the common red spider in the following summer. Examination of hop poles showed that large numbers of mites may hibernate in deep cracks. An emulsion containing 5 percent of a high-boiling neutral tar oil sprayed with force into the cracks of poles killed the great majority of mites, being more effective in this respect than an emulsion containing 5 percent of a semirefined petroleum oil. Of a number of washes applied in the summer to infested hops, emulsions of a highly refined (water-white) petroleum oil at 1 and 2 percent oil concentrations were effective in killing the mites. Lime-sulfur at concentrations of 1 in 30 and 1 in 60 also gave a complete control. A derris wash of 0.0056 percent rotenone content appeared to give a complete control at the second application, whereas it failed to do so at the first. There is evidence that the toxicity of a derris wash of the type used increased up to a point with the time after water is added to the powder. Liver of sulfur and colloidal sulfur at the concentrations used showed no marked toxicity, and the two spreaders used were also nontoxic. The petroleum oil emulsions and lime-sulfur caused some injury to foliage when applied in late June and the first 3 weeks in July. Lime-sulfur caused no injury to foliage or "burr" on the varieties tested when applied during late July and early August at concentrations ranging from 1 in 60 to 1 in 150. Concentrations smaller than 1 in 100 were not markedly toxic to the mites, but at 1 in 60 and 1 in 80 lime-sulfur wash was completely effective in killing all forms other than eggs.

Notes on three insect predators of the mite, namely, *Anthocoris nemorum* L., *Scymnus punctillum* Weise (*minimus* Rossi), and *Feltiella tetranychi* Rubs., are included.

Nematodes parasitizing insects (*U. S. Dept. Agr., Bur. Plant Indus. Rpt., 1935, p. 17*).—Brief reference is made to a promising nematode parasite recently discovered in corn earworm larvae, attacking them in the soil and killing them within a few days.

ANIMAL PRODUCTION

[Animal husbandry investigations of the Bureau of Animal Industry] (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt., 1935, pp. 5–14, 15, 16*).—Data are reported from studies on the composition of the butterfat of goats' milk; the influence of diets in which the protein intake was constant and the energy intake varied and vice versa on growth and development; the influence of three levels of protein intake on growth of swine; the development of the prophylactic feeding plan for vitamin A assay; a comparison of types of pigs on carcass desirability; comparisons of protein supplements on the quality of pork; the flavor of pork from hogs fed submaintenance rations; a method for estimating the percentage of bone in a beef carcass from the percentage of bone in the ninth, tenth, and eleventh rib cut; lamb curing and aging studies; flavor in commercial lards and other shortenings; feeding, breeding, management, and record-of-performance studies with beef and dual-purpose cattle, sheep and goats, swine, and horses; physiology and hatchability tests with eggs; and feeding tests with chickens and turkeys.

[Investigations with livestock] (*U. S. Dept. Agr., Sec. Agr. Rpt., 1935, pp. 95, 114, 115*).—Information is given on the supervision of live poultry markets, the prevention of "tremulous" air cells of eggs by shipping in rigid-type packs, the development of strains of dairy cattle of greater purity in their inheritance of high production, increasing the use of roughages in the feeding of dairy cattle, and developing wider uses of the byproducts of dairy processing plants.

[Investigations with livestock in Maryland] (*Maryland Sta. Rpts. 1934, pp. X, XI, XIX; 1935, pp. XVI–XVIII*).—Information is reported for 1934 which was obtained in tests on a comparison of fish and linseed meal for fattening steers, raising calves on remade skim milk with fish meal, and the development of a small electric milk pasteurizer. For 1935 the data relate to curing and storing procedures affecting the aging of hams, raising dairy calves on a minimum amount of whole milk, and a comparison of steam-dried and flame-dried menhaden fish meal for feeding heifers.

Dietary protein in relation to sterility, I. J. CUNNINGHAM and C. S. M. HOPKIRK (*New Zeal. Jour. Sci. and Technol., 17 (1935), No. 1, pp. 420–432, figs. 2*).—This paper from the Department of Agriculture, New Zealand, describes a feeding experiment in which male rats were rendered sterile by regulating their diets. All known constituents of the ration that are essential for male fertility were included in the diets.

It was found that sterility could be produced in two ways—(1) by feeding diets containing excessively high amounts of protein (65 to 82 percent), and (2) by feeding diets containing 15 to 18 percent of protein of which a large part was derived from maize (corn) or maize and gelatin. No reason was evident for the effect of the high protein diet. In the case of the low protein diet, the hypothesis is advanced that a deficiency of some of the essential amino acids, such as tryptophan, arginine, and lysine, failed to supply the testis with the liberal supply of these nutrients needed for proper nutrition.

The vitamin A content of pasture plants, III, IV (*Jour. Dairy Sci., 18 (1935), Nos. 9, pp. 573–578, fig. 1; 10, pp. 639–645, fig. 1*).—This is a continuation of this series of studies at the Idaho Experiment Station (E. S. R., 74, p. 249).

III. *Alfalfa* (*Medicago sativa L.*) *and smooth brome* (*Bromus inermis Leyss.*) *under pasturage conditions and fed green*, E. Woods, F. W. Atkeson, A. O. Shaw, I. W. Slater, and R. F. Johnson.—When sampled under pasturage conditions smooth bromegrass contained 396±27 rat units of vitamin A per gram. Under the same conditions alfalfa contained 269±17 units of vitamin A. For this study a rat unit was calculated from the daily dose in milligrams required to cause an average total gain of 12 g in 4 weeks.

IV. *White blossom sweet clover* (*Melilotus alba Desvx.*), *orchard grass* (*Dactylis glomerata L.*), *and meadow fescue* (*Festuca elatior L.*) *under pasturage conditions and fed green*, E. Woods, F. W. Atkeson, I. W. Slater, C. D. Arndt, and R. F. Johnson.—Second-year white blossom sweetclover was found to contain approximately 242±19 rat units of vitamin A activity per gram when sampled under pasturage conditions and fed in the fresh green state. First-year white blossom sweetclover contained 500±30 units of vitamin A per gram. Under similar conditions orchard grass contained 275±13 and meadow fescue 250±13 units per gram.

Although the differences among the higher ranking plants and the lower ranking ones in vitamin A values for the above and previously reported plants were statistically significant, there was little if any significant difference between any one plant and the plant ranked just above or below it. The fact that the plants studied were all commonly used in pastures and that all had high vitamin A values justified the conclusion that pasture is a potent source of vitamin A activity. Because of the large consumption of pasture plants and their high vitamin A values, dairymen may use mixtures of grasses adapted to their soil and climatic conditions without vitamin A activity becoming a limiting factor.

Effect of the drouth on Wyoming ranges, O. A. BEATH (*Natl. Wool Grower, 25 (1935), No. 8, pp. 14–16, figs. 6*).—In this paper from the Wyoming Experiment Station the author discusses the effects of the prolonged dry spell upon the ranges of the State, particularly in the Red Desert area.

Some new methods of preserving legume forage, A. E. PERKINS (*Ohio Sta. Bimo. Bul. 177 (1935), pp. 200–205*).—In this article the author discusses the ensiling, stack silage, A. I. V. or acid-treated silage, and artificial drying methods of preserving legume crops.

The digestibility of artificially dried roughages, J. A. NEWLANDER (*Vermont Sta. Bul. 400 (1935), pp. 12*).—Continuing these investigations (E. S. R., 73, p. 94), digestion coefficients were determined for a number of artificially dried feeds. Applying these coefficients to the composition of the feeds (dry basis), the percentages of digestible crude protein and total digestible nutrients were as follows: Corn silage, dried, 8.78 and 67.71; corn silage, wet, 4.57 and 68.24; oat hay, 10.5 and 70.57; Sudan grass, 12.44 and 65.25; soybean hay, 9 and 71.43; and millet, 8.05 and 67.96, respectively.

The nutritive value of the proteins of corn-gluten meal, linseed meal, and soybean-oil meal, K. L. Turk, F. B. Morrison, and L. A. Maynard (*Jour. Agr. Res.* [*U. S.*], *51* (*1935*), *No. 5, pp. 401–412*).—Continuing this series of investigations at the [New York] Cornell Experiment Station (E. S. R., 71, p. 681), metabolism trials were conducted with three growing wether lambs to determine the digestibility, storage, and biological value of the proteins of soybean oil, corn gluten, and linseed meals. The above feeds were added to a low nitrogen ration in such amounts as to furnish a protein level of 10 percent, with the other ingredients of the ration furnishing approximately 1 percent additional protein. All the rations were equalized in energy value. Repeating the trials gave six determinations for each feed.

The average coefficients of apparent digestibility for the protein of soybean oil meal, corn gluten meal, and linseed meal were 67, 66.3, and 63.3 percent, respectively. The average percentage of protein intake stored for the respective feeds was 33.8, 26.5, and 26.7. The average biological values were 72.8, 65.7, and 67.7 for the respective proteins. The results showed the superiority of the proteins of soybean oil meal over those of corn gluten and linseed meals. The study also indicated the possibilities of measuring differences in quality of protein using sheep and the nitrogen balance type of experimentation.

Commercial feeding stuffs, 1934–35, E. R. Tobey (*Maine Sta. Off. Insp. 156* (*1935*), *pp. 21–73*).—This is the usual report of the guaranteed and found analyses of 1,061 samples of feeding stuffs collected for official inspection during the year ended June 30, 1935 (E. S. R., 72, p. 372).

Commercial feeding stuffs, L. S. Walker and E. F. Boyce (*Vermont Sta. Bul. 399* (*1935*), *pp. 47*).—This is the usual report of the analyses for protein, fat, and fiber of 2,199 samples of feeding stuffs collected for official inspection during April 1935 (E. S. R., 73, p. 827).

Winter-finishing two-year-old grass steers, M. Jacob and H. R. Duncan (*Tennessee Sta. Bul. 156* (*1935*), *pp. 12, fig. 1*).—Feeding trials conducted over a 3-yr. period with 2-year-old steers were undertaken to determine the effect on rate of gain, finish, and market value of adding minerals to a ration of corn silage and cottonseed meal during the entire 120-day feeding period or during the last half of the period. A comparison was made also of molasses and ground shelled corn as supplements to the basal ration during the last 60 days of the feeding period.

The steers fed a ration of corn silage and cottonseed meal made gains at low costs, were given the highest appraisal on foot, and showed the smallest financial loss. The addition of corn or molasses to the basal ration did not improve the results in most cases. Corn was superior to molasses as a supplementary concentrate. The lots receiving molasses were not superior in condition of hair, quickness of shedding, or general appearance to those not receiving molasses. With a margin of only 34 to 55 ct., it was not profitable to feed these cattle.

A comparison of the values of cottonseed cake and corn for the supplemental feeding of range ewes, S. L. Smith (*Natl. Wool Grower, 25* (*1935*), *No. 10, pp. 21, 22*).—This is the report of 8 years' work at the U. S. Range Livestock Experiment Station, Miles City, Mont., in determining the relative values of corn and cottonseed cake for wintering range sheep. Both feeds were fed to ewes at the rate of 0.25 lb. per head per day. The supplements were fed in troughs to prevent losses which might occur by feeding on thawing ground or unpacked snow.

The type of supplement appeared to have little effect on the number of lambs dropped or weaned or on the weaning weight of the lambs. The experiment indicates that 1 lb. of corn had nearly the same feeding value as 1 lb. of cottonseed cake for wintering sheep in the northern Great Plains area.

Nutritional anemia in lambs, S. S. Wheeler (*Natl. Wool Grower, 25 (1935), No. 7, p. 12*).—The Wyoming Experiment Station undertook a study of nutritional anemia in lambs. One phase of the work dealt with its production in lambs kept under controlled conditions and the second phase with nutritional anemia in "normal" lambs raised under shed conditions.

In the first phase lambs were fed nothing but cows' milk, and during a 3-mo. period their hemoglobin level was reduced about two-thirds. Not until almost 4 mo. had elapsed, however, did the full effect of the restricted ration and environment become apparent. The addition of iron chloride or iron chloride and copper nitrate to the milk was followed by an immediate response in hemoglobin level.

Lambs fed with their dams in a shed with no pasture or green feed showed a gradual but progressive nutritional anemia up to the age of 3 to 4 weeks, but by 8 weeks the hemoglobin had practically returned to the birth level. Even when the lambs were most anemic there was no evidence of lack of thrift or well-being and no reduction in weekly gain.

It is concluded that only under unusual conditions does nutritional anemia seriously interfere with the normal growth of lambs.

Crossbreeding with western ewes, F. S. Hultz, J. A. Gorman, and S. S. Wheeler (*Wyoming Sta. Bul. 210 (1935), pp. 20, figs. 6*).—The results of 5 years' investigation on crossing purebred rams of different breeds with range ewes are reported. The analysis of the results was based on the marketability of the crossbred lambs used and the value of the lambs from these crosses for ewe replacement in commercial flocks. Two years' experience with the Suffolk breed are included.

The Hampshire crossbreds averaged 0.4 lb. heavier at market age than lambs sired by Lincoln rams, 1.6 lb. heavier than Rambouillet crossbreds, 2.9 lb. heavier than Southdown crossbreds, and 4.8 lb. heavier than Corriedale crossbreds. The ranking was the same on the basis of total gain from birth to market age. On the basis of 2 years' results the Suffolk crosses were superior in market weight, total gain, and average daily gain. The Suffolk crossbreds led in average slaughter grade on foot, followed in descending order by Southdown, Hampshire, Lincoln, Corriedale, and Rambouillet crossbreds.

In selling price per hundredweight the crosses ranked as follows: Southdown, Hampshire, Corriedale, Lincoln, and Rambouillet, while in selling value per lamb the ranking was Hampshire, Southdown, Lincoln, Corriedale, and Rambouillet. Southdown and Suffolk crossbred lambs had an average dressing percentage of 47.3, Hampshire 46.4, Corriedale 45.4, Lincoln 44.7, and Rambouillet 43.9. In carcass grade the ranking of the crossbreds was Southdown, Suffolk, Hampshire, Corriedale, Lincoln, and Rambouillet. The wool qualities of the crossbreds ranked on the basis of length of staple, fineness of fiber, crimp, and density for the various crossbreds were Rambouillet, Corriedale, Southdown, Hampshire, and Lincoln. It is pointed out, however, that differences in wool characteristics were small.

The authors note that if lambs are to be retained for ewe replacements the lower market value of some crossbreds is partially compensated for by the greater excellence of the fleeces.

The raising of hogs, G. W. Carver (*Alabama Tuskegee Sta. Bul. 40 (1935), pp. 7*).—The methods of feeding and management for the economical production of pork under Alabama conditions are described.

Returns from grains fed to swine, V. A. Freeman (*Michigan Sta. Quart. Bul., 18 (1935), No. 2, pp. 114–116*).—In this article the author has combined the results of a number of feeding tests to show the returns that may be expected from feeding corn, barley, and wheat to hogs. The results show that the rate of gain was practically the same for pigs fed shelled corn, ground wheat, and whole wheat. Whole barley was an inefficient feed, and the pigs fed ground barley made less efficient use of their feed than pigs fed corn or wheat.

The author points out that the information given should be considered in deciding which feed to purchase or whether to sell one feed and produce another under certain conditions. A table shows the returns from grain that may be expected with pork at different prices.

Continued investigations into the mineral requirements of growing pigs [trans. title], H. Isaachsen, O. Ulvesli, M. Husby, and K. Breirem (*Meld. Norges Landbr. Høiskole., 15 (1935), No. 6, pp. 477–515, figs. 2; Eng. abs., pp. 514, 515*).—A comparison was made of the efficiency of herring meal and cod meal as supplements to a cereal ration for growing and fattening pigs (E. S. R., 72, p. 821). The cod meal contained more calcium and phosphorus than the herring meal, and when fed in rations where the minerals were not balanced it was somewhat the better, but when the minerals were balanced the reverse was true. Herring meal contained a small amount of vitamin A and an appreciable amount of vitamin D, while cod meal was practically devoid of both. There was no appreciable difference, however, in the rate of growth on the two meals. A simple mineral mixture of ground limestone, calcium phosphate, and salt when fed with a ration of cereals and oil cakes gave as good gains and was more economical than two complicated and expensive mineral mixtures. The addition of small amounts of potassium iodide did not produce any beneficial effects upon growth. The calcium-phosphorus ratio of 1:1.22 appeared to give satisfactory growth and vigor.

Supplementing soil with iron and copper for the prevention of anemia in young pigs, L. H. Moe, W. A. Craft, and C. P. Thompson (*Jour. Amer. Vet. Med. Assoc., 87 (1935), No. 3, pp. 302–311, figs. 2*).—At the Oklahoma Experiment Station four groups of pigs were fed and housed similarly upon concrete floors. The pens for one group were kept free from soil, another group had free access to 50 lb. of moist soil, another had free access to a similar quantity of soil supplemented with 4.5 g of ferrous sulfate and 0.75 g of copper sulfate, and the fourth group had free access to the same amount of soil supplemented with 9 g of ferrous sulfate and 1.5 g of copper sulfate. The soil itself contained approximately 250 lb. of easily soluble iron sulfate per acre.

Differences in the averages of hemoglobin level at birth between the groups were insignificant. The level for each group declined between birth and 1 week of age, but the three treated groups did not decline as much as the control group. The hemoglobin level of each group increased from the first to the second week, and the difference in favor of each of the treated groups over the control at each period from the first to the fourth week, inclusive, was significant. The difference between the treated groups was significant only in the case of group 4.

The groups that showed the lowest hemoglobin values at 1 week of age also showed the least variability at this period. The litters having access to soil supplemented with iron and copper increased in variability of hemoglobin values at 1 week of age over the birth level, but the variability of these groups decreased after 1 week of age. An average of one pig per litter was lost, due to anemia, between the third and fourth weeks of age in the control group, but no losses that could be attributed to anemia occurred in the treated groups.

While all groups made similar gains in weight, the pigs in group 4 were significantly heavier at the third and fourth weeks than those in the other groups.

The comparative efficiency of various proteins for growing chicks, J. S. Carver, J. L. St. John, M. W. Miller, and G. E. Bearse (*Washington Sta. Bul. 321 (1935), pp. 27, figs. 3*).—Studies were undertaken at the Washington and Western Washington Experiment Stations to determine the comparative efficiency of Alaska herring fish meal, skim milk powder, high grade meat scrap (56 percent protein), and Manchurian soybean meal for growing chicks from hatching to maturity. These concentrates and combinations of them were also compared as to relative efficiency for growing chicks from hatching to sexual maturity. The experimental feeds were fed at levels of 13 and 16 percent protein.

In both experiments chicks fed 16 percent fish meal showed approximately the same growth at 6 weeks of age. At the same age chicks fed fish meal, as above, supplemented with skim milk powder were heavier than chicks in the other lots. The increased growth rate that was obtained when the milk was used was probably due to the presence of the vitamin G complex, but when milk was the sole supplement the growth results were not as good as those obtained from feeding fish meal or meat scrap. Milk exerted a laxative effect at the high levels. Chicks fed soybean meal at 13 and 16 percent protein levels showed poor growth at 6 weeks of age. With the exception of the soybean meal lot, the chicks fed 16 percent protein made somewhat better growth than those on the 13 percent level.

At 12 weeks of age the lot fed 16 percent protein from fish meal and skim milk powder still showed slightly better growth than those on the 13 percent level. In the meat scrap and soybean meal lots the 13 percent level showed the best growth. At 24 weeks of age there was little difference in the weight of pullets fed the lower and higher levels of fish meal, meat scrap, or skim milk powder, but both of the soybean meal lots showed retarded growth. At this age there was no advantage in growth from supplementing fish meal with skim milk powder, meat scrap, or soybean meal when the birds were fed at a 16 percent protein level.

The protein requirements of chicks steadily decreased until egg production began. During the 24-week period the chicks fed the low level of protein made more efficient use of this nutrient than those fed the high level. There was no nutritional paralysis in any lot fed skim milk powder, and there was no significant difference in mortality due to the protein fed except in the case of the lot fed 16 percent soybean meal. There was only a slight advantage in rate of maturity in feeding 16 percent levels of protein.

Mineral supplements for laying hens, M. W. Miller and G. E. Bearse (*Washington Sta. Bul. 320 (1935), pp. 22*).—The Western Washington Experiment Station undertook this study to evaluate properly the relative worth of minerals which are sources of both calcium and phosphorus and have been introduced for poultry-feeding purposes. A total of 8 lots of 60 White Leghorn pullets each was fed the same basal ration for 1 yr.

There was no appreciable difference in egg production, eggshell quality, egg weight, mortality, body weight, or hatchability of the lots fed eastern oystershell, clamshell, western oystershell, western Washington limestone, and aragonite as sources of calcium. In the lot fed phosphatic limestone as a source of calcium, egg production was significantly lower, but in other respects it was equal to the other lots. The results in the lot in which bonemeal was replaced as a source of phosphorus by dicalcium phosphate fed with eastern oystershell were equal in all respects, except production, to all of the other lots which received their phosphorus from bonemeal. Production in the dicalcium phosphate lot was slightly lower than in the lots fed eastern oystershell, clamshell, western oystershell, limestone, and aragonite.

The influence of calcium carbonate in the feed of laying hens upon digestion, G. D. Buckner and A. H. Harms (*Poultry Sci., 14 (1935), No. 6, pp. 360, 375, 380*).—A preliminary test was undertaken at the Kentucky Experiment Station to determine the effect of the amount of calcium carbonate ingested upon the digestion of other nutrients by laying hens. Pullets were divided into lots of four birds each and were fed certain quantities of limestone or marl at stated intervals. The droppings of individual birds were collected over a 3-day period, and were analyzed for ash, hydrochloric acid insoluble matter, phosphoric acid, calcium oxide, protein, fat, and fiber.

The results indicated less digestion of nitrogen-free extract and more digestion of protein in the presence of an abundance of calcium carbonate. The authors point out that while this interpretation is only tentative it is evident that digestion was affected materially by the presence of the calcium carbonate.

The relative protein efficiency and the relative vitamin G content of common protein supplements used in poultry rations, H. S. Wilgus, Jr., L. C. Norris, and G. F. Heuser (*Jour. Agr. Res. [U. S.], 51 (1935), No. 5, pp. 383–399, figs. 2*).—In studies at the [New York] Cornell Experiment Station, the utilization for growth processes of the protein of protein-rich feeding stuffs combined with an equal amount of protein from yellow corn meal and wheat flour middlings was determined by nitrogen balance trials, using White Leghorn chicks. The results are expressed as relative protein efficiency, obtained by dividing the percentage of protein stored from a given ration during the seventh week of age by that from a standard casein ration, and multiplying by 100.

The relative protein efficiency of a number of common protein supplements was as follows: Vacuum- and steam-dried whitefish meals 104, dried skim milk 100, domestic sardine fish meal 98, flame-dried whitefish meal 94, steam-dried menhaden fish meal and Asiatic sardine meal 91, soybean meal 88, flame-dried menhaden fish meal 80, meat scrap 77, whale meat meal 64, corn gluten meal 61, and ground soybeans 58. The variations in the values of these feeding stuffs were due apparently not only to inherent differences in the raw materials but also to various factors involved in their manufacture.

A method was developed for determining the relative growth-promoting vitamin G content of feeding stuffs based upon the gain produced over the control diet by adding 5 or 10 percent of the supplement under study. These results were expressed in terms of dried pork liver affording an equivalent gain, calculating the final results in percentage, with dried pork liver as 100.

The vitamin G potency of a number of common protein supplements was as follows: Dried skim milk 19, vacuum-dried whitefish meal 10, domestic sardine meal 9, meat scrap 6, steam- and flame-dried white and menhaden fish meals and Asiatic sardine meal 5, soybean meal and ground soybeans 3, and corn gluten meal and dried blood 0. The growth-promoting properties of these protein supplements were related to the vitamin G content as well as to the quality of protein. The range within many of the products was rather wide, due to methods of manufacture and ingredients used.

The antihaemorrhagic vitamin of the chick, H. Dam (*Biochem. Jour., 29 (1935), No 6, pp. 1273–1285*).—Continuing this study (E. S. R., 74, p. 246), an investigation was made of the nature and distribution of the antihemorrhagic vitamin, using White Leghorn chicks as experimental animals.

The vitamin was found to be fat soluble, and one of the richest sources of this factor was hog-liver fat. Cod-liver oil was practically devoid of the vitamin. Hens' eggs contained the vitamin in the yolk, but apparently this was not an extremely rich source. Hemp seed and certain vegetables were good sources, while yellow corn, unpolished rice, and sunflower seeds were poor sources of the factor. The vitamin occurred in the easily soluble nonsterol fraction of the unsaponifiable matter.

Large amounts of Vitamin A or D in the diet did not prevent the disease. This factor was somewhat similar to vitamin E with respect to solubility and resistance to heating in air, but was different from vitamin E because large quantities of wheat germ or wheat-germ oil did not give complete protection against the disease.

Dietary haemorrhagic disease in chicks, H. J. ALMQUIST and E. L. R. STOKSTAD (*Nature, 136 (1935), No. 3427, p. 31*).—Continuing the study at the California Experiment Station of this nutritional disease of chicks (E. S. R., 71, p. 370) it was found that the disease could be prevented by as little as 0.5 percent of dehydrated alfalfa. The antihemorrhagic factor was located in the unsaponifiable, ether-extractable portion of alfalfa. Completely extracted alfalfa, chlorophyll, and the saponifiable fraction of alfalfa ether extract failed to prevent the disease. The factor could be adsorbed from its ether solution by activated carbon and was stable to heating at 120° C. for 24 hr.

The fishmeal used in the basal diet could protect against the disease if allowed to remain in a wet condition for several days, affording opportunity for the action of micro-organisms. Rice bran treated in a similar way also afforded protection. Replacing 50 percent of polished rice by wheat or yellow corn failed to prevent the disease, indicating little, if any, of the antihemorrhagic factor in these cereals. Apparently this factor could not be attributed specifically to any feed ingredient.

Variations of egg yolk color and characteristics produced by feeding and environment, W. P. ALBRIGHT and R. B. THOMPSON (*Poultry Sci., 14 (1935), No. 6, pp. 373–375*).—The Oklahoma Experiment Station secured eggs from 11 farms for a study of their storage qualities. The general location of the ground used by the poultry, the feed, management, housing conditions, health, sanitation, and access to feed lots, barnyards, and manure piles were factors that were carefully observed on each farm. All of the eggs were candled, and those unfit for storage were discarded. A few eggs from each lot were broken to measure interior quality while fresh, and after 5 to 8 months' storage all eggs were again candled and broken for examination.

Such factors as temperature at which the eggs were held before going into storage, access to barnyard litter, and unsanitary surroundings had an adverse effect on the storage quality of the eggs. Such feeds as garlic and large doses of cod-liver oil produced off-flavors in the eggs. Certain green feeds, weeds, and other feeding stuffs were found to discolor yolks in some cases and to darken yolks in other cases. Rations containing 30 percent of linseed meal or soybean meal as the sole protein supplement produced discolored yolks when fed to hens in pens.

Firm white of fresh and storage eggs, H. J. ALMQUIST and F. W. LORENZ (*Poultry Sci., 14 (1935), No. 6, pp. 340, 341*).—Continuing these investigations (E. S. R., 71, p. 368), this study was made on the liquefaction of egg white during cold storage from the standpoint of the individual influence of the hen. Infertile day-old eggs produced by trap-nested White Leghorn hens were divided alternately as laid into two groups, one of which was analyzed immediately for percentage of firm white while the other was oil-dipped and kept in cold storage at approximately 32° F. This procedure was followed in four experiments over a period of 2 yr.

The percentage of firm white in stored eggs had a positive high correlation with that of fresh eggs from the same hens. Eggs with high percentages of firm white showed a lower percentage of liquefaction of the firm white during storage.

Poultry flock improvement, J. C. Graham (*Massachusetts Sta. Bul. 325* (*1935*), *pp. 8, fig. 1*).—This study was undertaken to determine whether it was possible to maintain or improve body weight, feather color, egg production factors, hatchability, and size, shape, and color of eggs without pedigreeing but through the annual introduction of new blood from reliable sources. This bulletin reports the preliminary results of the investigation.

To date, it appears possible to build up or maintain the production qualities and hatchability of a flock by the annual introduction of new blood if (1) care is taken in the selection of the foundation stock, (2) the new blood has the ability to raise the level of the factors sought, (3) undesirables are eliminated before the breeding season begins, and (4) the breeding program is persistently followed. Hybrid vigor made its appearance in egg weights, bird size, hatchability, and possibly in production, but it exerted its greatest influence in hatchability. The cost of this method of flock improvement was insignificant as compared with the cost of pedigree breeding.

The value of the pedigree in breeding for egg production, G. O. Hall (*Poultry Sci., 14* (*1935*), *No. 6. pp. 323–329*).—An analysis was made of the records of the poultry flock at the [New York] Cornell Experiment Station in order to determine the value of mass selection based on the pedigree.

The records of the first-year egg production of high-line birds showed that marked and steady progress may be made in breeding for egg production where the pedigree combined with careful selection of the individual was used as a basis for selecting breeding stock. Correlation studies on 4,937 individuals showed a significant relation between the production of the dam and the production of the sire's daughter, and a significant relation between the production of the sire's dam and the production of the sire's daughter. The combined record of the dam and the sire's dam had a closer relation to the production of the daughters than did either of these records alone.

The statistical treatment of hatchability data, W. A. Hendricks (*Poultry Sci., 14* (*1935*), *No. 6, pp. 365–372*).—Concluding this series of papers from the U. S. D. A. Bureau of Animal Industry (E. S. R., 74, p. 385), methods are presented for computing two figures useful for characterizing the hatchability of the fertile eggs produced by a given lot of birds, in which $\overline{p}$ represents the hatchability of fertile eggs for the most typical bird of the lot and *H* the fraction of all the fertile eggs produced by the lot which hatch. These statistics are based on two distinct concepts regarding the information to be extracted from a set of data and should be interpreted accordingly. Methods for computing estimates of the standard errors and for making comparisons of the values of the statistics obtained for different lots of birds are also given.

Comparison of electric and coal brooders in early season brooding, J. A. Davidson and H. J. Gallagher (*Michigan Sta. Quart. Bul., 18* (*1935*), *No. 2, pp. 97–105, figs. 3*).—Results of two tests showed that the rate of feathering of broilers was slower under electric hovers than under coal hovers. With the type of ventilation used, insulation was not justified from the standpoint of fuel consumption. A fan or air agitator on one of the electric hovers did not materially increase the amount of power used, but was helpful in the early brooding period when the hover was down.

With feed at $2.25 per 100 lb., coal at $14 per ton, electricity at 3 ct. per kilowatt-hour, shavings at $9 per ton, and chicks at $10 per 100, it was necessary to market 83 percent of the chicks started at prices exceeding 25 ct. per pound in order to realize any profit. With the ration used, 4.8 lb. of feed were required to produce 1 lb. of marketable broiler. Growth apparently was not hastened by the extreme cold areas. Crowding under the electric brooder may have been responsible for the slow feather growth. The electric hover was more convenient to operate, especially in maintaining a uniform temperature, but a satisfactory ventilation system must be devised if such a brooder is to become as satisfactory as coal brooding for the early season.

Winter housing for layers, D. C. Kennard and V. D. Chamberlin (*Ohio Sta. Bimo. Bul. 177 (1935), pp. 190–196, fig. 1*).—This article discusses some of the fundamental principles of temperature, ventilation, and dampness control, and their practical application to the winter housing of poultry flocks.

Capons and caponizing, G. Robertson and S. S. Munro (*Canada Dept. Agr. Pam. 167, n. ser. (1935), pp. 9, figs. 8*).—This pamphlet discusses the reasons for caponizing, the selection and preparation of the birds, the instruments and equipment necessary, the operation itself, and the care of the birds after the operation.

Mortality of the turkey embryo, W. M. Insko, Jr., and J. H. Martin (*Poultry Sci., 14 (1935), No. 6, pp. 361–364, fig. 1*).—The Kentucky Experiment Station reports the results of a study to determine the distribution of embryo mortality in turkey eggs.

It was observed that two critical periods of mortality occurred during the incubation of turkey eggs. The first of these occurred on the fourth day and the other on the twenty-fifth day. Mortality during the intervening period was quite low and evenly distributed between these periods. The peaks of mortality occurred at comparable periods of incubation for both turkey and chicken eggs, and it is concluded that any practice which tends to lessen mortality of chick embryos should be applicable to turkey embryos.

A preliminary report on the vitamin G requirement of turkeys, G. F. Heuser (*Poultry Sci., 14 (1935), No. 6, pp. 376–378, figs. 2*).—White Holland turkeys were divided into 5 lots of 20 poults each at the [New York] Cornell Experiment Station and were fed for 8 weeks on a basal ration containing 24 percent protein. Liver meal was added to this ration in varying amounts as a source of vitamin G.

It was found that for the first 4 weeks turkey rations should contain a minimum vitamin G equivalent of about 16 percent of dried skim milk. During the second 4 weeks the requirement dropped to an equivalent of about 10 percent, after which it was not greater than the equivalent of 7 percent of dried skim milk. The quantitative requirements for the first two periods of 4 weeks each were directly proportional to the relative growth, indicating that the need for the growth-promoting phase of the vitamin G complex was directly related to the rate of growth.

DAIRY FARMING—DAIRYING

Practical dairy tests and fundamentals of dairying, A. D. Burke (*Milwaukee, Wis.: Olsen Pub. Co., 1935, pp. [7]+VIII+396, figs. 31*).—This treatise, prepared for both the student of dairying and the practical plant operator, contains a brief discussion of fundamental information concerning the dairy industry and many helpful facts of practical value in both the processing of dairy products and the elimination of many defects. A complete series of tests used in analyzing milk and dairy products, giving sufficient information and detail to simplify and clarify each test, is also included.

Report of the Chief of the Bureau of Dairy Industry, 1935, O. E. REED (*U. S. Dept. Agr., Bur. Dairy Indus. Rpt., 1935, pp. 1–10, 11, 12, 13–27*).—Investigations with dairy cattle resulted in data on breeding, feeding, and management studies at the Beltsville, Md., and field experiment stations, relation of the conformation and anatomy of the dairy cow to her milk- and butterfat-producing capacity, the protein and vitamin requirements of dairy cows, and herd improvement.

Results were obtained in studies with dairy products on the bacteriology and chemistry of milk; development of greater uses for whey and other dairy byproducts; improving the physical qualities of ice cream and cheese; quantity of milk and rate of release; dairy sanitation; milk-plant management; milk-quality improvement, including the effectiveness of clarification and the determination of curd tension; production of chocolate-flavored milk; Devonshire clotted cream; dairy manufacturing investigations; and the introduction of Swiss cheese manufacturing in Wisconsin and Ohio.

A list of the publications of Bureau workers is appended.

[Studies in dairy husbandry in the Southern States] (*Assoc. South. Agr. Workers Proc., 36 (1935), pp. II+26*).—The following papers were presented before the dairy husbandry division at the thirty-sixth annual convention of the Association of Southern Agricultural Workers held at Atlanta, Ga., January 30 to February 1, 1935: Some Results on Protein and Mineral Metabolism Observed in Experiments in Comparing Alfalfa and Timothy Hays, by C. W. Holdaway (p. 2); A Comparison of Alfalfa Hay and Soybean Hay with and without Mineral and Cod Liver Oil Supplement, by C. O. Jacobson (p. 3); Shrimp Meal for Milk Cows, by J. L. Fletcher and R. H. Lush (p. 4); Electricity in the Sterilization of Dairy Utensils, by G. W. Kable (pp. 4, 5); The Flooded System of Refrigeration for Small Dairy Plants, by T. B. Harrison (pp. 5, 6); The Normal and Experimental Development of the Mammary Glands, by W. R. DeMoss (p. 7); Breeding Management of the Dairy Herd, by P. M. Reaves (pp. 8, 9); Testing for Sediment in Cream, by E. L. Fouts and J. I. Keith (p. 9); Cream Quality Improvement, by C. A. Hutton (p. 10); Results of the 1934 Grazing Test with Bermuda and Carpet Grass Pastures by J. P. LaMaster and E. C. Elting (p. 11, 12); Molasses as a Preserving Agent in Making Soybean Silage, by E. C. Elting and J. P. LaMaster (pp. 11, 13); Report of Pasture Experiments from 1930–1934, by A. D. Pratt (pp. 13–15); Five Year Results on Monthly Clipping of Pastures, by R. H. Lush (p. 15); Sandhill Grazing Problems, by E. W. Faires (pp. 16, 17); A Dairy Farm Program for Mississippi, by J. S. Moore (pp. 19, 20); Some Features of the Work of the Federal Dairy Field Stations, by J. R. Dawson (pp. 20, 21); Roughage Feeding Investigations, by J. A. Simms (p. 22); Succulence in the Dairy Ration, by A. D. Pratt (p. 24); Progress Report on Kudzu as Pasture for Dairy Cattle, by W. H. Eaton and A. D. Burke (p. 25); and Effect of Cottonseed Meal In Dairy Rations on the Milk and Butter, by J. I. Keith, A. H. Kuhlman, and E. Weaver (pp. 25, 26).

The economics of feeding alfalfa hay and grain to Holstein cows, F. B. HEADLEY (*Nevada Sta. Bul. 140 (1935), pp. 17, figs. 5*).—These experiments were undertaken in cooperation with the U. S. Department of Agriculture to determine the effect of various rations on production, reproduction, and health of dairy cattle. Holstein cows were divided into three groups of five head each and fed as follows: (1) Alfalfa hay only, (2) alfalfa hay and a grain mixture, and (3) alfalfa hay and a grain mixture every other lactation. The experiment was begun in 1925, and the cows remained in their respective groups throughout productive life.

Early in the investigation it became apparent that bloat was associated with grain feeding, especially when barley made up the bulk of the grain mixture. The average annual production of the cows on roughage alone was 8,090 lb. of milk and 283 lb. of butterfat, while the average annual production of the cows receiving grain was 9,498 lb. of milk and 331 lb. of butterfat. It was found that the production of butterfat increased faster than the consumption of total digestible nutrients, making high-producing cows more economical than low-producing cows. During the first weeks of lactation the cows usually consumed less feed than was required for maintenance and production but lost in weight, while later in lactation the reverse was true. The grain-fed cows consistently produced more milk during the first 260 days than the cows receiving no grain, but after this period the average production was not increased. Five factors found to affect the profitableness of feeding grain were (1) the price of the hay, (2) the price of grain, (3) the prices of dairy products, (4) the production of the cow, and (5) the quality of the hay.

The effects of prices of hay, grain, and butter on returns are shown diagrammatically.

Lespedeza hay for dairy cattle, W. B. NEVENS (*Jour. Dairy Sci., 18 (1935), No. 9, pp. 593–598*).—The object of a feeding trial at the Illinois Experiment Station was to measure the feeding value of lespedeza hay for milk production and for gain in weight of dairy heifers by comparing it with alfalfa hay. The varieties of lespedeza tested were either *Lespedeza striata* (Japan clover) or *L. stipulacea* (Korean lespedeza). Two groups of cows and two groups of heifers were fed through two periods of four weeks each. One group of each type of animal received alfalfa hay during one period and lespedeza hay during the next period.

The lespedeza hay was somewhat less palatable than the alfalfa hay. When comparable grades of hay were compared, they proved to be practically equal pound for pound as judged by milk yields and gain in weight of cows and in gain in weight of heifers. No difference in the laxative properties or conditioning effects of lespedeza and alfalfa hay were observed. The lespedeza hay was lower in protein, fiber, total ash, and lime content than alfalfa hay.

Growth, reproduction, and lactation of dairy cattle fed dry rations varying in mineral and vitamin contents, I. R. JONES, J. R. HAAG, and P. M. BRANDT (*Oregon Sta. Bul. 329 (1934), pp. 46, figs. 7*).—This study was undertaken to determine the effect on growth, reproduction, and lactation of rations differing in their calcium and phosphorus contents and in their vitamin A and D contents. Four lots of calves were started in 1925 on the following rations: (1) Second-cutting alfalfa hay and a grain mixture of ground barley and ground oats 2:1 by weight, (2) cheat hay, later changed to oat hay, and the same grain mixture as above with a protein supplement added (linseed meal at first, later changed to peanut meal because of its lower phosphorus content), (3) the same as the second group with calcium and phosphorus added in the form of sterilized bonemeal, and (4) the same as the third group with the addition of cod-liver oil. In the fall of 1929 a fifth lot receiving the same ration as the second group was added.

The ration for group 2 after a milk-feeding period of about 6 mo. apparently satisfied the requirements of dairy heifers for growth, but was not adequate for normal reproduction and lactation. Adding bonemeal to this ration appeared to be of value for improving reproduction. The further addition of cod-liver oil did not improve growth but apparently improved reproduction and lactation, with the vigor of calves at birth being especially increased. The ration for group 1 did not promote as good growth as the ration for group 4, but was equal to the latter for milk production.

A daily intake of 18 g of calcium and phosphorus, respectively, appeared to be barely sufficient for normal growth of dairy heifers. Increasing the daily intake of calcium to about 30 g and of phosphorus to about 20 g by feeding bonemeal and adding cod-liver oil resulted in slightly better growth. A daily ration during lactation of about 19 lb. of oat hay, 6 lb. of ground barley, 8 lb. of ground oats, and 2 lb. of peanut meal apparently supplied sufficient digestible protein and energy and possibly sufficient phosphorus, but there were indications that the calcium supply was too low. Fairly liberal milk production was obtained when 30 to 35 g each of feed calcium and phosphorus was supplied daily. The group receiving oat hay and grain failed to maintain itself as a herd due to reproductive disturbances, manifested in the form of temporary and permanent sterility and the production of weak and blind calves.

The effect of soybeans in the rations of dairy cows upon the vitamin A value of butter, J. W. Wilbur, J. H. Hilton, and S. M. Hauge (*Jour. Dairy Sci., 18 (1935), No. 10, pp. 661–665, figs. 2*).—In this study at the Indiana Experiment Station alfalfa hay was fed as the roughage to one group of cows and late-cut soybean hay to a second group. In addition, raw soybeans and roasted soybeans were substituted for linseed meal in the grain ration of each group during successive feeding periods. The vitamin A values of the butter from the milk produced by the cows were determined by biological assay.

It was found that at a constant level of vitamin A intake dairy cows produced butter of lower vitamin A value when soybeans replaced linseed meal in the grain ration. Apparently soybeans suppressed the transfer of vitamin A from the ration to the butterfat. Roasting the soybeans in an attempt to correct this action was unsuccessful. Feeding late-cut soybean hay resulted in butters of somewhat lower vitamin A value than when alfalfa hay was fed. Although soybeans had a suppressing action on the formation of vitamin A in butterfat, it was possible to produce butters of fairly high vitamin A value, even when soybeans were fed, if the roughage portion of the ration had a high vitamin A potency.

Vitamin D studies in cattle.—II, The vitamin D sparing action of magnesium in the ration of dairy cattle, C. F. Huffman and C. W. Duncan (*Jour. Dairy Sci., 18 (1935), No. 9, pp. 605–620, figs. 3*).—Continuing this series of studies (E. S. R., 74, p. 249), this investigation was undertaken to determine the relationship of magnesium to rickets in calves when the basal rachitogenic ration was supplemented with (1) magnesium in the form of the carbonate or the oxide, and (2) the efficacy of these compounds when a limited amount of vitamin D was introduced into the ration.

Adding magnesium carbonate to a rachitogenic ration failed to prevent the manifestation of clinical rickets in calves. Adding this compound to a ration consisting of a grain mixture and wheat straw after the onset of rickets caused an increase in the plasma calcium and promoted the calcification of a fractured vertebra.

A rachitogenic ration consisting of yellow corn, oats, corn gluten meal, linseed oil meal, calcium carbonate, and sodium chloride 50:20:20:8.5:1:0.5 supplemented with 5 cc of cod-liver oil per day did not protect calves from rickets. The addition of 1 percent, on the dry matter basis, of magnesium carbonate to this ration prevented the clinical symptoms of rickets to 10.5 mo. of age. When the same level of magnesium oxide was added to the ration no clinical evidence of rickets was observed. The ash and mineral values of the bones indicated better calcium and phosphorus utilization due to the ingestion of magnesium supplements. The results indicate that the magnesium content of feeds for dairy cattle may contribute to their antirachitic effect.

The effect of season of the year and advancing lactation upon milk yield of Jersey cows, P. T. D. Arnold and R. B. Becker (*Jour. Dairy Sci., 18 (1935), No. 9, pp. 621–628, fig. 1*).—The Florida Experiment Station made a study of the seasonal influence upon daily milk yield, using the same method applied in a previous study (E. S. R., 74, p. 94) to butterfat variations.

The relatively uniform environment of the State was not conducive to significant differences in yearly milk production between groups of Jersey cows calving at different seasons of the year. Advancing stage of lactation, irrespective of season of the year, produced a relatively uniform rate of decline in monthly milk yield from the second through the seventh month of milk production. The progressively greater rate of decline after the seventh month was associated with the inhibiting factor of advancing gestation. The seasonal influence on milk yield, irrespective of stage of lactation, resulted in a maximum rate of yield during June and a minimum rate during November and December. The peak of production was reached in advance of the mean maximum temperature early in the summer rainy season.

Box stalls versus tie and stanchion stalls for milk-producing cows, C. F. Monroe, W. E. Krauss, and C. C. Hayden (*Ohio Sta. Bimo. Bul. 177 (1935), pp. 196–200, fig. 1*).—In this test three lots of four cows each were used to determine whether the type of stall affected the comfort and contentment of the cow and whether this added comfort increased the milk and butterfat production. The feeding, care, and management were the same in all lots during the 150-day test. The lots were rotated between the different stalls every 50 days.

The type of stall was without influence on the production of milk and butterfat. The use of box stalls may sometimes be justified as a form of insurance against injury by other cows or against accidents which may happen in other stalls. These stalls also offer some degree of segregation against certain diseases and also prevent the stealing of food.

[Experiments with dairy products in Maryland] (*Maryland Sta. Rpt. 1935, pp. XVIII–XX*).—Information is reported in tests on some factors influencing the whipping properties of cream and the stability of the finished product, factors affecting the sale of dairy products at roadside markets in Maryland, and soft-curd milk.

Bacteriological methods for the analysis of dairy products, P. A. Downs et al. (*Jour. Dairy Sci., 18 (1935), No. 10, pp. 647–656*).—This is a committee report submitted to the American Dairy Science Association in which various methods for the bacteriological examination of evaporated and condensed milk are made available in condensed form. The views expressed are those of the committee and, as in previous years (E. S. R., 70, p. 155), are presented for criticism and suggestion.

A comparison of methods of detecting streptococci in freshly drawn milk samples, W. N. Plastridge, E. O. Anderson, and F. J. Weirether (*Jour. Dairy Sci., 18 (1935), No. 9, pp. 583–592*).—The [Connecticut] Storrs Experiment Station compared six different methods of detecting the presence of streptococci in freshly drawn samples of milk for the purpose of selecting the most efficient means of detecting shedders of streptococci which were capable of causing infectious bovine mastitis.

It was found that the microscopic examination of films prepared from incubated milk showed the presence of the causative organism of chronic streptococcal bovine mastitis in a larger number of instances than (1) direct microscopic examination of films prepared from whole milk or sediment, and (2) blood agar plates inoculated with a 4 mm loopful of whole milk, or a 4 mm loopful of sediment, or 1 cc of a 1:10 dilution of the sample. In the absence of other laboratory evidence, the finding of streptococci in incubated samples should not be taken as conclusive evidence of infection with the organism commonly responsible for chronic infectious bovine mastitis. The significance of the finding in such cases can be determined only by isolation and identification of the streptococcus found in the sample.

Observations on the freezing of milk and cream.—I, The effect of fat concentration upon the distribution of constituents in the frozen and unfrozen portions of partially frozen milk and cream, F. B. Baldwin, Jr., and F. J. Doan (*Jour. Dairy Sci., 18 (1935), No. 10, pp. 629–638, figs. 6*).—The Pennsylvania Experiment Station undertook this investigation to study systematically the progressive freezing of milk and cream, over the entire range to total freezing, in an attempt to explain some of the apparent inconsistencies in the literature relative to fat distribution. Other objectives were to determine whether cream of 25 percent fat content and over freezes homogeneously with respect to the ingredients other than fat and to note the possible effect of the fat phase on the phenomenon.

When whole milk was partially frozen in an undisturbed condition the fat concentration in the frozen and unfrozen portions over the entire range of freezing was dependent upon the cream-rising phenomenon of the milk and its speed relative to the speed of freezing. The concentration also depended to some extent on the shape and size of the container. Milk with normal creaming ability showed variable concentrations of fat in the frozen and unfrozen portions from the time freezing first became evident until the milk was completely frozen. The fat concentration of the unfrozen portion of milk in which the creaming ability had been destroyed increased progressively with the degree of freezing, while that of the frozen portion decreased at first but finally approached the fat percentage of the original milk as the degree of freezing approached 100 percent.

Increasing fat concentrations in milk or cream retarded the diffusion or concentration of milk constituents into the unfrozen portion of the freezing product. When the fat concentration reached 25 percent, diffusion was practically prevented and the cream froze homogeneously. Diffusion was probably inhibited by the increased viscosity with increased fat content, and also because of the more effective sealing of the interstices between developing ice crystals by the increased amount of fat in the form of solidified globules. Homogenization increased the fat content by restricting the concentration of ingredients in the unfrozen portions of freezing cream when sufficient fat was present to increase the viscosity.

Report on lactose in milk, E. R. Garrison (*Jour. Assoc. Off. Agr. Chem., 18 (1935), No. 3, pp. 408, 409*).—In this paper from the Missouri Experiment Station, the author describes a method for clarifying milk to be used in the polarimetric determination of the lactose in milk.

Preparing samples of butter for analysis, D. H. Nelson (*Jour. Dairy Sci., 18 (1935), No. 10, pp. 667–670, fig. 1*).—In this paper from the California Experiment Station the author describes a mechanical mixer for softening and thoroughly mixing butter previous to sampling for analysis. The precautions that must be observed in using this type of mixer and its advantages are discussed.

A method for the microscopic examination of butter, A. C. Fay (*Jour. Dairy Sci., 18 (1935), No. 9, pp. 603, 604*).—In this paper from the Kansas Experiment Station a method for the microscopic examination of butter is described. The method lends itself to the routine examination of large numbers of samples. The method may also be used to advantage for the microscopic examination of heavy cream.

The creatine test for acetylmethylcarbinol plus diacetyl in butter cultures, B. W. Hammer (*Jour. Dairy Sci., 18 (1935), No. 9, pp. 579–581*).—At the Iowa Experiment Station the method of O'Meara was employed for the rapid testing of butter cultures for acetylmethyl carbinol plus diacetyl and appeared to give satisfactory results. The general procedure of the method was as follows:

In a test tube having an inside diameter of about 0.5 in. 2.5 cc of culture was placed, and a small amount of creatine was added. Strong sodium hydroxide equal in volume to the volume of the culture was poured into the tube and the mixture thoroughly shaken and allowed to stand. If relatively large amounts of acetylmethyl carbinol plus diacetyl were present in the culture, a red color developed at the surface of the mixture in a few minutes and soon extended to a depth of 0.25 in. or more. With smaller quantities of the product, the red color developed more slowly and the colored portion was comparatively shallow. Cultures which were decidedly lacking in flavor and aroma may show no red color even after holding the test mixture for hours.

Six years of progress in improving the quality and standardizing the composition of Oregon butter, G. H. Wilster (*Oregon Sta. Bul. 335 (1935), pp. 34, figs. 9*).—This bulletin reports the results of educational and confidential scorings from approximately 3,000 churnings of butter submitted monthly during a 6-yr. period by Oregon creameries. Samples were scored when about 10 days of age and after 1 mo. of storage.

During the first year 40.9 percent of the samples scored 91 or above, while during the sixth year 83 percent scored 91 or above. The average score of all butters increased 0.8 point during the 6 yr. The methods of manufacturing and the keeping quality of the butter improved during the period. The average decrease in score during 1 mo. of storage at 40° to 50° F. was 0.82 point during the first year and 0.5 point during the sixth year. The fat content of the butter showed little change. With the adoption of the single standard for butter composition, the moisture content of the butter increased 0.6 percent and the salt content decreased by the same amount. The yeast and mold counts showed little change during the investigation, with only 27.4 percent of the samples having yeast and mold counts of less than 101 per cubic centimeter of melted butter.

The author points out the financial advantages to the production of the highest quality butter possible. The plans for the future of this work and the methods for attacking the problem are discussed.

The preparation of mold powder for blue-veined cheeses, R. V. Hussong and B. W. Hammer (*Jour. Dairy Sci., 18 (1935), No. 9, pp. 599–601, fig. 1*).—In this paper from the Iowa Experiment Station the method that has been adopted for the preparation of mold powder to be used in the manufacture of Iowa Blue cheese (E. S. R., 73, p. 235) is described.

Irradiation failed to prevent molding of cheese, W. V. Price (*Food Indus., 6 (1934), No. 4, pp. 163, 171, fig. 1*).—A series of tests was made at the Wisconsin Experiment Station to determine the value of irradiating cheese to prevent surface mold in foil-wrapped packages. Aged cheese was cut into pieces, and each piece was placed on a square of aluminum foil. One piece was wrapped immediately. The other pieces were exposed to the rays of an arc lamp at a distance of 4 ft. for periods of 1, 3, and 5 min., respectively. After exposure all cheese was wrapped and held at 45° F., and the samples were examined at 1-, 3-, and 5-week intervals.

After one week's storage there was no mold on any of the cheeses. At the end of 3 weeks numerous mold colonies were found on the control group, while a few were present on the cheese exposed for 1 and 3 min. After 5 weeks the mold on the surface of the control cheese had spread to form a feltlike growth, and it was not possible to distinguish between the control group and cheese irradiated for 1 min. On the cheese irradiated for 3 min. the mold appeared to be less vigorous and thinner than on the control, while on the cheese irradiated for 5 min. the mold growth was scanty and thin. A "scorched" flavor developed on the surface of the treated cheese, and while not objectionable on the samples irradiated for 1 min. it was quite pronounced on all other cheeses.

Some observations on the germicidal efficiency of chloramine-T and calcium hypochlorite, D. B. Charlton and M. Levine (*Jour. Bact., 30 (1935), No. 2, pp. 163–171, figs. 6*).—The Iowa Experiment Station made a study of the effect of temperature, concentration, and reaction on the germicidal efficiency of chloramine-T. It was found that for a given concentration of available chlorine as chloramine-T a rise of 10° C. resulted in a decrease in the time required to kill bacterial spores of about 82 percent when the initial reaction was pH 6 and approximately 71.5 percent at pH 8.7. Doubling the disinfectant concentration at a given initial reaction and constant temperature reduced the killing time about 40 to 60 percent. In the pH range from 6 to 8.8 an increase in acidity markedly reduced the killing time.

Experiments with hypochlorites indicated that pH was the greatest single factor affecting the germicidal activity of these compounds. "Available chlorine" was not found to be a direct measure of the germicidal value of the calcium hypochlorite studied. A solution containing 1,000 p. p. m. of available chlorine was only slightly more germicidal than the same solution diluted with distilled water to 100 p. p. m., and much less efficient than 20 p. p. m. of the same disinfectant at pH 8.3. The killing time of various concentrations of calcium hypochlorite was 64, 70, and 5 min. for solutions of 1,000 p. p. m. at pH 11.3, 100 p. p. m. at pH 10.4, and 20 p. p. m. at pH 8.3, respectively.

VETERINARY MEDICINE

A textbook of general bacteriology, E. O. Jordan (*Philadelphia and London: W. B. Saunders Co., 1935, 11. ed., reset, pp. 825, figs. 202*).—A new and partially rewritten edition of this work (E. S. R., 66, p. 665). The important topic of bacterial variation is dealt with in a new and separate chapter; the chapters on immunity, on streptococci, on *Salmonella*, on *Brucella*, on *Rickettsia*, and on spirochetes have received many modifications and additions; and the section on the viruses and virus diseases has been largely rewritten. In an attempt to promote grouping by natural relationships a few changes have been made in the arrangement of chapters.

A bactericidal principle in excretions of surgical maggots which destroys important etiological agents of pyogenic infections, S. W. Simmons (*Jour. Bact., 30 (1935), No. 3, pp. 253–267*).—In continuation of a study of maggot therapy by Robinson et al. (E. S. R., 74, p. 256), the author reports upon work in which a potent bactericide was obtained from surgical maggots of the species *Lucilia sericata*.

"Bactericidal tests with this substance were conducted with seven species of bacteria of etiological importance in pyogenic infections. The results showed that 5- to 10-min. exposures were usually sufficient to give 100 percent kill of dense saline and broth suspensions of the organisms. The addition of organic material apparently has less effect on the potency of this material than on that of ordinary disinfectants. The active principle is of a nonviable nature and is not destroyed by autoclaving for 20 min. at 10-lb. pressure. No indication of lysis could be demonstrated, and the thermostability and other reactions of this substance rule out the possibility of a bacteriophage as the active principle. The material was desiccated, and in this dry condition it apparently maintains its potency over a longer period than when in aqueous solution. The remarkable bactericidal potency of the excretions against *Staphylococcus aureus*, hemolytic streptococci, and *Clostridium welchii* accounts in part for the gratifying results obtained in such infections under maggot therapy.

"The investigation reveals a field with potentialities of producing other new and useful disinfectants from living organisms."

The bactericidal properties of excretions of the maggot of Lucilia sericata, S. W. SIMMONS (*Bul. Ent. Res., 26 (1935), No. 4, pp. 559–563*).—The data here presented are noted above.

The development of a blood volume formula and the testing of its accuracy in the domestic animals (horse, sheep, rabbit, pig), E. E. HODGSON (*[War Dept. U. S.], Off. Surg. Gen., Vet. Bul., 29 (1935), No. 3, pp. 205–232*).—The author reports upon the development of a formula for the rapid calculation of the blood volume in an animal's body. The integral parts of this include the consideration of the relationship between the weight of the animal, the average percentage of the body which is due to blood, and the specific gravity of the blood.

[Work in animal pathology and parasitology by the Bureau of Animal Industry] (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt., 1935, pp. 16–23, 35–55*).—The work of the year (E. S. R., 72, p. 528) referred to includes tests of the germicidal power of various dyes; the preparation and distribution of tuberculin and mallein; the preparation and use of stained antigen for the diagnosis of pullorum disease; stained antigen for diagnosis and vaccination against Bang's disease; the technic of hog cholera vaccination; skin-lesion reactors to tuberculin; vesicular exanthema of hogs; vesicular stomatitis; eradication of scabies and of dourine; the diagnosis and control of glanders, dourine, and rabies; the testing of biological products; the streptococci involved in bovine mastitis; the transmission of infectious equine encephalomyelitis; alkali disease (selenium poisoning); miscellaneous diseases, including equine infectious anemia, rabies, swine erysipelas, outbreaks of disease in swine due to *Salmonella suipestifer*, a disease of swine due to *Corynebacterium pyogenes*, a nonvirus cornstalk disease, shipping fever (hemorrhagic septicemia) of cattle, abscessed lymph glands of swine, and actinomycosis of the peritoneum of young calves; stock-poisoning plants; livestock poisoning by minerals, alkaloids, etc.; tick eradication; hog cholera control; bovine tuberculosis and its eradication; mastitis control; parasites of horses, ruminants, swine, poultry, and other animals; and treatment for internal and external parasites.

Twenty-year development program.—VI, Proposed for the division of veterinary medicine, C. H. STANGE ET AL. (*Ames: Iowa State Col., 1935, pp. [2]+73, [pls.] 17*).—Following a general consideration of a proposed program for the division of veterinary medicine by C. H. Stange (pp. 1–37), the subject is dealt with under the heading of veterinary anatomy by H. L. Foust (pp. 38–41), veterinary hygiene by I. A. Merchant (pp. 42–48), veterinary medicine by C. H. Covault (pp. 49–51), veterinary obstetrics by F. E. Walsh (pp. 52–55), veterinary pathology by E. A. Benbrook (pp. 56–61), veterinary physiology and pharmacology by H. D. Bergman (pp. 62–66), veterinary surgery by G. R.

Fowler (pp. 67-70), and the veterinary research institute by C. Murray (pp. 71-73).

[Work in animal pathology and bacteriology by the Maryland Station in 1933-34] (*Maryland Sta. Rpt. 1934, pp. XXI, XXII*).—Brief reference is made to the research work of the year, including the economic loss from Bang's disease (infectious abortion) in dairy herds in Maryland, means of transmission of blackhead of turkeys, cecal protozoan fauna of turkeys, and artificial cultivation of intestinal protozoa.

[Work in animal pathology and bacteriology at the Maryland Station in 1934-35] (*Maryland Sta. Rpt. 1935, pp. XX-XXIII*).—Brief reference is made to the work in animal pathology and bacteriology of the year (see above) and by the biological and livestock sanitary service laboratories, including a study of the transmission of blackhead in turkeys, a herd survey of animals reacting to Bang's disease, an infection known as "running fits" in dogs, and a further investigation of equine encephalomyelitis (E. S. R., 73, p. 108).

Report on the Veterinary Department, Burma, for the year ending 31st March 1935, D. T. Mitchell (*Burma Vet. Dept. Rpt., 1934-35, pp. [3]+26, pls. 5*).—Included in this report are tables showing the deaths from contagious diseases of animals in Burma during the year 1934-35 and the results of preventive inoculations during this period. Brief reference is made to veterinary research work.

Annual report of the veterinary division for the year 1934, H. M. Stuchbery (*Fiji Dept. Agr. Ann. Bul., 1934, pp. 17-25*).—The occurrence of and control work with diseases and parasites of livestock are included in this report (E. S. R., 73, p. 842).

Annual report of the veterinary service for the year 1934, R. J. Roe (*Cyprus Dept. Agr. Ann. Rpt., 1934, pp. 27-38*).—Included in this report (E. S. R., 72, p. 529) is an account of the occurrence of infectious and parasitic diseases of livestock and a list of parasites of domestic animals occurring in Cyprus.

[Contributions on parasites of animals] (*Jour. Parasitol., 21 (1935), No. 6, pp. 426, 428, 429, 431, 432, 433, 434, 435, 436, 439, 440, 442, 443, 444, 445*).—Among the contributions presented at the eleventh annual meeting of the American Society of Parasitologists (E. S. R., 72, p. 688) held at St. Louis, Mo., in December 1935 and January 1936, abstracts of which are here presented, are the following: The Endogenous Phases of the Life-Cycle of *Eimeria miyairii*, Coccidian Parasite of the Rat, by R. L. Roudabush (p. 426); Studies on Ascarid [*Ascaridia lineata* (Schneid.)] Nutrition, by J. E. Ackert and J. H. Whitlock (p. 428); The Persistence of Immunity of the Chicken to the Protozoan Parasite *Eimeria tenella*, by C. A. Herrick (p. 429); Acquired Immunity in *Trichomonas foetus* Infection of Cattle, by J. Andrews, F. W. Miller, and C. W. Rees (p. 429); Infectivity of *Trichinella spiralis* After Successive Feedings to Rabbits, by J. E. Alicata (p. 431); A Survey of the Parasites of North American Rabbits, by J. G. Arnold, Jr. (p. 431); Experimental Infections and Superinfections of Pigs With Lungworms [*Metastrongylus elongatus* and *Choerostrongylus pudendotectus*], by B. Schwartz and J. T. Lucker (p. 432); Single Larva Infections of *Strongyloides ratti* Sandground 1925 as an Approach to Certain Problems of *Strongyloides* Bionomics, by G. L. Graham (p. 432); The Blood Picture of Normal and Trichinized White Rabbits [*Trichinella spiralis*], by W. W. Wantland (pp. 432, 433); The Relation of Vitamin A Deficiency to Ascariasis in the Dog, by W. H. Wright (p. 433); Double Infestations of Snails [*Stagnicola emarginata angulata*] With the Cercariae of Digenetic Trematodes, by W. W. Cort, D. B. McMullen, and S. Brackett (p. 433); A Method for Transplanting Adult Trematodes [*Echinostoma revolutum*], by P. Beaver (p. 434); A Note on the Life History of *Mosesia chordeilesia* n. sp.

(Lecithodendriidae), by D. B. McMullen (p. 434); The Life History of *Cotylophoron cotylophorum*, a Trematode From the Ruminants, by H. J. Bennet (p. 435); The Larval Stages of *Acanthocephala*, by H. J. Van Cleave (pp. 435, 436); The Whole Life Cycle of *Strongyloides*, by E. C. Faust (pp. 439, 440); *Ornithodorus hermsi* Wheeler as a Vector of Relapsing Fever in California, by W. B. Herms and C. M. Wheeler (p. 440) (E. S. R., 74, p. 525); The Study of Metacercariae as an Approach to Life History Problems, by S. H. Hopkins (p. 442); Ants [*Tetramorium caespitum* and *Pheidole* sp.] as Intermediate Hosts for Two Species of *Raillietina* [*R. echinobothrida* and *R. tetragona*] Parasitic in Chickens, by M. F. Jones and M. W. Horsfall (pp. 442, 443); Six Years' Intensive Observation of the Seasonal Prevalence of a Tick Population [*Dermacentor andersoni*] in Western Montana, by C. B. Philip (p. 444); The Western Dog Tick, *Dermacentor occidentalis* Neum., a Vector of Bovine Anaplasmosis in California, by W. B. Herms and D. E. Howell (p. 444); and A Study of the Anoplocephaline Cestodes of North American Rabbits, by J. G. Arnold, Jr. (p. 445).

The liver fluke problem in Hawaii, M. C. Hall (*Hawaii Sta., Anim. Husb. Div. Prog. Notes No. 12 (1935), pp. [1]+18, figs. 2*).—A report of a survey made of the liver fluke (*Fasciola hepatica*) problem in Hawaii in 1935.

Attempts to influence a coccidian infection negatively through the diet, E. R. Becker and P. S. Spencer (*Jour. Parasitol., 21 (1935), No. 6, p. 455*).—Experiments referred to lend support to the belief that limiting the population of coccidia through supplements to the diet and drugs will prove very difficult.

Merozoite infection in coccidiosis, R. L. Roudabush (*Jour. Parasitol., 21 (1935), No. 6, pp. 453, 454*).—An experiment is reported which shows that the merozoites of at least one species of *Eimeria* (*E. miyairii*) are infective under certain conditions.

Aujeszky's disease [trans. title], L. Panisset (*Rec. Méd. Vét., 111 (1935), No. 11, pp. 853–890, figs. 14*).—A review of the literature and present knowledge, with a 5-page list of references.

Attempts to isolate Brucella abortus from the blood of dogs in experimental brucellosis, C. Olson and W. H. Feldman (*Jour. Amer. Vet. Med. Assoc., 88 (1936), No. 1, pp. 51–54*).—The authors report upon a study made of bacteremia in dogs with experimental brucelliasis and upon attempts to induce a bacteremic state by means of histamine and anaphylactic shock.

"In each of five dogs that were intravenously inoculated with *B. abortus* of swine origin, bacteremia was demonstrated rather constantly within the first 48 hr. following inoculation. Two of the five animals we attempted to sensitize to horse serum failed to give clinical evidence of anaphylactic shock when a shocking dose of horse serum was administered. Bacteremia was not demonstrable in either of these two after they had received the dose of horse serum which was intended to produce shock. In two other dogs of the group, anaphylactoid shock was produced by histamine. The single isolation of *Brucella* from the blood of only one of these two animals indicates that this mechanism is probably not closely associated with the induction of bacteremia in experimental brucelliasis of the dog.

"The presence of *Brucella* organisms in the tissues of the various dogs during the course of the experiment was ascertained by splenic biopsy 39 days after inoculation. The organisms were isolated from each dog at that time.

"There was no significant disturbance in the agglutinative titer of the serums of two dogs after histamine shock."

A study of methods used for the isolation of Brucella abortus from milk, C. P. Fitch and L. M. Bishop (*Jour. Bact., 30 (1935), No. 3, pp. 332, 333*).—In the course of the work reported 24 samples of milk naturally infected with

B. abortus were studied. Guinea pigs were intraperitoneally inoculated with eight types of inoculum taken from each of the 24 samples. At autopsies of the guinea pigs 4 weeks later the spleens were cultured, and the cultures were incubated under 10 percent carbon dioxide. An agglutination test was made with the blood serum obtained from each.

"The milk sample was considered positive only if cultures of *B. abortus* were isolated from the spleen. A larger number of positive results were obtained when cream was inoculated in some form. The skim milk layer seldom contained sufficient numbers of bacteria to infect a guinea pig. Sediment inoculation gave fewer positive results than those of the cream layer. The use of gravity cream for guinea pig inoculations and cultures appears to be the method of choice. The numbers of positive results were greater, and the collection of cream by this method is extremely simple.

"Raw milk was shown to have a definite growth-inhibitory action on cultures of *B. abortus*. The action corresponded to the so-called 'bactericidal action of milk.' This action may explain the failures of direct cultures from cream which is positive by guinea pig inoculations."

Outbreak of undulant fever due to Brucella suis, B. G. Horning (*Jour. Amer. Med. Assoc., 105 (1935), No. 24, pp. 1978, 1979*).—A report is made of an outbreak of undulant fever (14 cases with 3 deaths) in a home for elderly persons, in which it is concluded that raw milk from a herd of 36 cows was the source of infection. *B. suis* was isolated from the blood of 2 of the patients and from an abscess of a third. "Blood was drawn from 32 swine kept by the institution. Nine were positive and 7 suggestive for *Brucella* infection. The cattle had opportunity for natural infection from the swine."

Vaccination against Johne's disease, W. A. Hagan (*Cornell Vet., 25 (1935), No. 4, pp. 344–353*).—The details here reported of vaccination work with Johne's disease, due to *Mycobacterium paratuberculosis*, are presented in tabular form. Under the conditions existing, the vaccination did not prevent infection, although there were indications that the vaccinated animals withstood the exposure somewhat better than the controls.

The biological characters of the Streptococcus commonly associated with mastitis (Str. agalactiae), M. A. Engelbrecht (*Cornell Vet., 25 (1935), No. 4, pp. 313–333, figs. 2*).—This report of further studies (E. S. R., 73, p. 840), which deals with the biological character of the nonhemolytic (alpha) group of udder streptococci, is contributed from the Wisconsin Experiment Station.

"The 103 strains of nonhemolytic streptococci, alpha type, from the cows' udder and commonly associated with mastitis were found to be identical and remarkably constant in their biological characters when those tests were applied which we have found to be thoroughly reliable. These udder strains belong to a species for which Kitt long ago applied the name *S. agalactiae*.

"Strains from the cows' feces can be separated from the udder forms by their ability to ferment inulin and raffinose, which is not possessed by the udder forms, and their inability to hydrolyze sodium hippurate.

"The human strains were found not to be as uniform as the strains from the udder and feces. Several of the strains in both groups corresponded to those found in bovine feces.

"In both human throats and lesions about half of the strains differed from the feces' strains in their action on raffinose and inulin and from the udder strains in their action on sodium hippurate. This nonsodium hippurate splitting group common in human materials should be regarded as *S. mitis*."

A list is given of 25 references to the literature.

A short note on an epizoötic amongst rabbits due to Salmonella aertrycke, M. L. Ahuja (*Indian Jour. Med. Res., 22 (1935), No. 3, pp. 475, 476*).—A brief account is given of an epizootic among rabbits in the animal houses of the Central Research Institute at Kasauli due to an organism having the biological characteristics of *S. aertrycke.* The affection proved fatal in from 2 to 4 days. Guinea pigs kept in the same room with the affected rabbits were not attacked. The affection appeared to have been spread by food and drink probably infected by flies, since several hundred white mice kept in flyproof cages in the same room with the rabbits remained healthy.

The antigens of Salmonella anatum, P. R. Edwards (*Jour. Bact., 30 (1935), No. 3, pp. 269–276*).—In studies at the Kentucky Experiment Station the author has found *S. anatum* to possess the specific antigens of the Reading and Newport types of *Salmonella.* "With the exception of one culture studied, the nonspecific factors of *S. anatum* were identical with those of the London type and of *S. abortus-ovis.* The nonspecific antigens of one culture more closely resembled those of the Kunzendorf type. In three of the cultures the somatic antigens were identical with those of the London type. Two cultures possessed a well-developed somatic antigen unlike those of any other *Salmonella* studied."

Poisonous plants of Pennsylvania, E. M. Gress (*Penn. Dept. Agr. Bul. 531 (1935), pp. 52, figs. 44*).—Practical, and in most cases illustrated, accounts are given of the plants poisonous to livestock in Pennsylvania.

The toxicity of broomweed (Gutierrezia microcephala) for sheep, cattle, and goats, F. P. Mathews (*Jour. Amer. Vet. Med. Assoc.,* 88 (*1936*), *No. 1, pp. 55–61, figs. 3*).—In work conducted at the Loco Weed Laboratory of the Texas Experiment Station at Alpine in cooperation with the U. S. D. A. Bureau of Animal Industry, the perennial herbaceous plant *G. microcephala* was proved to be toxic for sheep, cattle, and goats.

"Fatal results were produced in sheep by feeding 8 lb. of the plant during a period of 5 days, in a steer by feeding 24 lb. in 3 days, and in a goat by feeding 11 lb. in 14 days. The lesions were confined to the kidneys and liver. In acute cases there were hemorrhages into Bowman's capsules and into the interstitial connective tissue. In milder cases there was no hemorrhage but pronounced necrosis of the epithelium of the convoluted portions of the tubules. The histopathology of the liver was found to be liquefaction necrosis. As a rule losses are sporadic and occur as a result of unfavorable range conditions."

[Control of infectious cattle diseases] (*U. S. Dept. Agr., Sec. Agr. Rpt., 1935, pp. 93–95*).—The progress of control work with bovine tuberculosis, Bang's disease, and mastitis of dairy cows is described.

Systematic investigations into the spread of some frequent infections of the cow's udder elucidated by examination of a large Danish herd and some conclusions drawn therefrom, H. C. Bendixen (*Cornell Vet., 25 (1935), No. 4, pp. 371–383, figs. 4*).—The results of an investigation of a high-yielding herd of 147 dairy cows by the Institute for Veterinary Hygiene and Bacteriology at Köbenhavn (Copenhagen), in which a systematic cultural study of the milk of individual quarters of the udder of each cow was made during the period from March 1 to May 19, 1933, are reported upon.

Abortions in cattle free from Bang's disease, C. F. Clark (*Michigan Sta. Quart. Bul., 18 (1935), No. 2, pp. 95, 96*).—Reference is made to abortions that may occur in herds free from *Brucella abortus* infection. A tabular summary is given of the breeding history of three herds of cattle free from Bang's disease extending over a period of 4 yr., in which 5.4 percent of abortions occurred. It is pointed out that such abortions are due to a variety of disease-producing germs, to a previous severe illness, to faulty nutrition, and perhaps occasionally to direct injury.

The establishment and maintenance of herds of cattle free from Bang's disease (infectious abortion), B. T. Simms and O. H. Muth (*Oregon Sta. Bul. 332* (*1934*), *pp. 11*).—The methods by which herds may be freed and maintained free from Bang's disease, based upon control work in Oregon, are described.

A study of the channels of Brucella infection in bulls with results of conjunctival and skin exposures to bovine and porcine strains, A. L. Delez (*Jour. Amer. Vet. Med. Assoc.*, *88* (*1936*), *No. 1*, *pp. 24–31*).—The results of a study made at the Indiana Experiment Station of the possible transmission of *Brucella* infection in bulls by conjunctival and skin exposures are reported.

Intravenous injections of *Brucella* cultures in two young bulls did not result in positive evidence of infection. One showed a slight focal interstitial epididymitis. A 6-month-old bull, which received a porcine strain intravenously, developed a 1:1,000 serum titer, but no other evidence of infection was obtained.

"Greater agglutinin response occurred in bulls exposed through the conjunctiva to bovine strains than to porcine strains. Intact skin exposures resulted in practically no agglutinin response to either bovine or porcine strains. Agglutination reactions followed the deposition of bovine strains on the abraded skin of the scrotum.

"No *Brucella* organisms were recovered from the genitalia of bulls which were exposed to bovine or porcine strains through the conjunctiva or skin. An 18-month-old bull which received conjunctival exposure to a recently isolated bovine strain developed a serum agglutination titer of 1:500 in 3 weeks. Histological examination showed a well-marked focal interstitial epididymitis."

Some observations on the pathology of Brucella abortus infected udders of heifers, L. B. Sholl (*Cornell Vet.*, *25* (*1935*), *No. 4*, *pp. 354–358*).—The results of a study conducted at the Michigan Experiment Station with 29 heifers are detailed in tables. The findings indicate that the udders of heifers may become infected with *B. arbortus* as early as 8 mo. of age, and that changes similar to those previously described by the author and Torrey (E. S. R., 65, p. 70) may occur in nonlactating udders.

Brucellosis in Panamanian cattle, R. Randall ([*War Dept. U. S.*], *Off. Surg. Gen.*, *Vet. Bul.*, *29* (*1935*), *No. 4*, *pp. 332–335*).—Observations of a dairy herd in the interior of the Republic of Panama reported upon, indicate that Bang's disease occurs in dairy and beef cattle and is sufficiently common to be of economic importance.

Bovine encephalomyelitis in Mexico, J. Escalona and F. Camargo (*Jour. Amer. Vet. Med. Assoc.*, *88* (*1936*), *No. 1*, *pp. 81–83*, *fig. 1*).—A brief account is given of an encephalomyelitis of bovines in Mexico, observed during the past 30 yr. and known by stockmen and farmers as derriengue or tronchadeo. It attacks horses, mules, burros, and hogs and has been observed in wild animals such as deer and coyotes, but is more noticeable among cattle than other animals because of their economic importance. It has been observed only on the west coast of Mexico and mostly in altitudes of between 800 and 1,200 m.

Some observations on fetal pneumonia, L. B. Sholl (*Cornell Vet.*, *25* (*1935*), *No. 4*, *pp. 359–364*).—Observations at the Michigan Experiment Station here reported show pneumonia to be a rather common and troublesome problem with many breeders, and indicate that fetal pneumonia is much more prevalent in animals affected by Bang's disease. "The presence of well-marked pneumonia in calves 1 to 10 days old strongly suggests prenatal infection, and we believe that fetal pneumonia is of considerable economic importance in considering the losses due to diseases of the reproductive organs."

The treatment of lungworms (Dictyocaulus) of sheep and of calves by intratracheal injections in the U. S. S. R. [trans. title], I. W. Orloff (*Bul. Acad. Vét. France, 8 (1935), No. 7, pp. 390–401*).—The author reviews the control work that has been carried on in the U. S. S. R. against lungworms of sheep and calves through intratracheal injection of iodine solutions. Treatments with (1) 1 cc of tincture of iodine, 50 cc of glycerin, and 150 cc of distilled water and (2) 1 g of iodine, 1.5 g of potassium iodide, and 100 cc of distilled water, later diluted with 1,400 cc of tap water, were found by a special commission of the Central Institute of Helminthology of Moskva (Moscow) to be similar in their efficiency. It is considered important that the treatment be given with the animal in the dorsal position. The method is now largely employed in the U. S. S. R.

A list is given of 25 references to the literature.

Fistulous withers and poll-evil: Equine and bovine onchocerciasis compared, with an account of the life-histories of the parasites concerned, J. S. Steward (*Vet. Rec., 15 (1935), No. 52, pp. 1563–1573, pls. 4*).—Reports are made of a series of cases of fistulous withers and poll evil studied. An analysis has shown that the serum of 29 of 43 affected animals examined reacted to the agglutination test for *Brucella abortus*. Thirty-eight of 53 affected horses were shown to harbor *Onchocerca cervicalis*, and it is considered probable that the percentage infected is much higher, as a negative result in the examination for microfilariae may easily be misleading.

In a study of the normal carriers of *O. cervicalis*, the midge *Culicoides nubeculosus* was the only insect in which complete development of the microfilaria was observed, but evidence was obtained that *C. obsoletus* might possibly act as a vector and one specimen of *C. parroti* became infected.

In referring to bovine onchocerciasis, it is pointed out that *O. gutturosa*, which is quite common in English cattle, occurs in species of blackflies of the genus *Simulium*. *C. nubeculosus* does not appear to be capable of picking up the microfilariae of *O. gutturosa* which occur in the skin of the cow in the same situation as *O. cervicalis* in the horse.

A list of 32 references to the literature is included.

Equine dhobie itch a symptom of filariasis: A report on fifty-six cases, J. R. Underwood (*[War Dept. U. S.], Off. Surg. Gen., Vet. Bul., 28 (1934), No. 3, pp. 227–236*).—Studies conducted at Fort William McKinley of the so-called equine dhobie itch, prevalent among Army animals in the Philippines for more than 30 yr., are reported upon. Microfilariae were found only in skin lesions of 56 cases observed from November 5, 1932, to October 20, 1933. It is concluded that this microfilaria is not the larval form of *Setaria equinum*, *Onchocerca reticulata*, or *Filaria sanguinis equi*; it does not correspond in size or habits with any microfilaria described in the literature cited. The adult was not found in 3 animals autopsied, and its life history is unknown. The disease is described as a verminous dermatitis, chronic and remittent in type and course, and characterized by the eruption of a few or many patches of papules and nodules which contain microfilariae.

Neoarsphenamine in the treatment of influenza in horses, J. W. Miner (*[War Dept. U. S.], Off. Surg. Gen., Vet Bul., 28 (1934), No. 3, pp. 271, 272*).—A brief report is made of 48 cases of equine influenza treated at Fort Riley, Kans., during 1933 by intravenous injection of 3 g of neoarsphenamine dissolved in 30 cc of water, with an average loss of 8.1 days from duty.

Isolation of Trypanosoma hippicum from the cerebrospinal fluid of infected horses, R. Randall ([*War Dept. U. S.*], *Off. Surg. Gen., Vet. Bul., 29 (1935), No. 3, p. 204*).—In the course of the experimental study of murrina at Ancon, Canal Zone, the presence of *T. hippicum* in the cerebrospinal fluid of two horses which 5 weeks previously had received intravenous inoculations of 0.1 cc of guinea pig blood, containing 20 trypanosomes per microscopic field, was demonstrated through the intraperitoneal inoculation of white rats.

Murrina in horses experimentally infected with Trypanosoma hippicum, R. Randall ([*War Dept. U. S.*], *Off. Surg. Gen., Vet. Bul., 29 (1935), No. 4, pp. 321–331, figs. 3*).—Observations of two horses experimentally infected with *T. hippicum* led to the conclusion that death is not associated with exhaustion of the blood sugar as has been suggested by investigators of other trypanosome infections. The disease was observed to be characterized by a progressive anemia, the fatal termination having been associated with renal deficiency and severe acidosis.

The mercuric chloride test in equine trypanosomiasis (T. evansi) and glanders (A. mallei), R. Randall ([*War Dept. U. S.*], *Off. Surg. Gen., Vet. Bul., 29 (1935), No. 3, pp. 255–261*).—The author points out that the complement fixation test for the detection of trypanosomiasis (*Trypanosoma evansi*) and glanders (*Pfeifferella mallei*) in horses and mules, although time-consuming and requiring extensive laboratory equipment, is biologically specific and reliable. The mercuric chloride test, on the other hand, while requiring only one reagent and very little laboratory equipment, is not biologically specific and is, therefore, unreliable for the diagnosis of specific diseases in horses and mules.

Canine tick paralysis produced by Dermacentor variabilis, J. Wells (*North Amer. Vet., 16 (1935), No. 1, pp. 41, 42*).—An account is given of the clinical evidence that paralysis occurs in dogs infested by the American dog tick, it having been recognized by the author and at least one other veterinarian in Florida.

Infectious laryngo-tracheitis in poultry, N. Dobson (*Vet. Rec., 15 (1935), No. 49, pp. 1467–1471, figs. 5*).—The filtrate obtained by use of Berkefeld V and N filters when inoculated intratracheally into healthy birds reproduced the symptoms and lesions observed in naturally affected birds. The work led to the conclusion that the disease, the outbreak of which occurred originally in Norfolk, England, is immunologically indistinguishable from the infectious laryngotracheitis as known in the United States.

Fowl leukosis, F. D. Patterson (*Jour. Amer. Vet. Med. Assoc., 88 (1936), No. 1, pp. 32–44, figs. 7*).—The author's studies, conducted at the Iowa Experiment Station (E. S. R., 68, p. 676; 74, p. 393), are considered to indicate beyond a reasonable doubt "that the myeloid, erythroid, lymphoid, nerve, and eye types of fowl leucosis, as discussed in this paper, are different expressions of the same transmissible disease; that the neoplastic lesions variously termed round-cell sarcoma, lymphosarcoma, lymphatic leukemia, and aleukemic and leukemic lymphocytoma are fundamentally the same as lymphoid leucosis; that the disease in all of its expressions can be transmitted by the injection of suspensions prepared from fresh fowl leucosis material, by direct and indirect pen contact, and by rearing susceptible chicks on infective litter: that inheritance plays a very important role in regard to the degree of resistance and susceptibility of chickens to fowl leucosis. These hereditary factors are of great importance in the control of and studies of fowl leucosis."

Hemocytoblastosis and its relation to the development of fowl paralysis and fowl leukemia, M. W. Emmel (*Jour. Amer. Vet. Med. Assoc., 88 (1936), No. 1, pp. 45–50, fig. 1*).—It has been found in work at the Florida Experiment

Station that "hemocytoblastosis can be induced by oral exposure and the intravenous injection of micro-organisms of the paratyphoid group and by the intraperitoneal injection of tissue emulsions and filtrates of the organs of affected birds. During hemocytoblastosis the blood cells show various types of degeneration. Hemocytoblastosis induced by the causal micro-organisms or the transmitting agent may lack the impetus necessary to the development of fowl paralysis or leukemia. Young birds affected with hemocytoblastosis show retarded growth, while laying birds show decreased egg production. Birds used in experiments must be hemocytoblastosis-free to insure obtaining reliable data."

Inheritance of resistance to bacterial infection in animals: A genetic study of pullorum disease, E. Roberts and L. E. Card (*Illinois Sta. Bul. 419 (1935), pp. 465–493, figs. 2*).—Following a brief introduction and a description of materials and methods, the experimental results obtained over a period of 10 yr. and involving more than 29,000 birds, the results of crosses, and the biological aspects of methods of disease control are considered. The existence of hereditary factors for resistance and susceptibility of pullorum disease is considered to have been shown by the following results:

"Selection was effective in producing strains of the domestic fowl more resistant than were unselected stocks in respect to infection by *Salmonella pullorum*. The selected stocks were consistent in maintaining resistance through successive generations. The F_1 generation produced by crossing resistant and susceptible stock was as resistant as the resistant parents. Progeny of the F_1 individuals mated to resistant were significantly more resistant than were the progeny of the backcross to susceptible. In the F_2 generation susceptible and resistant strains were recovered by selection. A susceptible male mated to susceptible females produced progeny which were much less resistant than were progeny of the same male mated to resistant females. No significant difference was found between the progeny of susceptible and resistant females mated to the same resistant male. Acquired immunity was not present in the experimental birds, the progeny of infected hens exhibiting no greater resistance to disease than the progeny of noninfected hens, infection and freedom from infection being determined by the agglutination test. Resistance is dominant to susceptibility, but probably more than one gene is involved.

"In an examination of the blood of noninoculated young chicks the number of erythrocytes was found to be greater in the resistant (6 out of 7 cases) than in the susceptible strain. The number of leucocytes was greater in the susceptible strain. The percentage of neutrophiles was lower in the resistant individuals (6 out of 7 cases). In inoculated chicks, the percentage of neutrophiles was much higher among the susceptibles at 6, 7, and 9 days than among inoculated resistant individuals of the same ages."

The control of avian tuberculosis by means of the tuberculin test, K. D. Downham (*Vet. Rec., 15 (1935), No. 48, pp. 1448, 1449, figs. 3*).—The author concludes that the tuberculin test is a satisfactory means of controlling avian tuberculosis when repeatedly applied until no reactors are found and when fresh ground is available after removal of reacting birds.

Mortality in young turkeys associated with trichomoniasis, A. G. Gierke and W. R. Hinshaw (*Jour. Amer. Vet. Med. Assoc., 88 (1936), No. 1, pp. 76–80, figs. 2*).—In observations made in California during the past 3 yr. of outbreaks of enteritis in young turkeys, characterized clinically by watery, foamy diarrhea, a rapid course, and a heavy mortality, the disease has been found to be associated with marked trichomonad infection of the lower intestine and ceca. "Clinical and epizoological data furnish evidence that these flagellates, the species of which is still undetermined, may play an important role in producing the disease. Preliminary transmission experiments were successful in establishing the parasites in the intestines of normal turkeys, but the clinical picture of the disease was not reproduced by artificial inoculation.

"Field studies indicate that insanitation, feeding methods, and faulty management may be influencing factors. Adult carriers appear important in the transmission of the parasites to the young birds."

AGRICULTURAL ENGINEERING

Engineering field tables (*U. S. Dept. Agr., Forest Serv., 1935, 2. ed. pp. IV+118, figs. 18*).—This is the second edition of this handbook. It contains sections on curves, surveying, meridian, trigonometric functions, earthwork, road surfacing, pipe culverts, concrete, timber, and miscellaneous.

[Soil conservation and agricultural engineering investigations] (*U. S. Dept. Agr., Sec. Agr. Rpt., 1935, pp. 60–64, 107–109*).—Types of soil erosion and practical control measures are briefly described, the results of a reconnaissance survey of erosion are presented, and the progress results are presented of investigations on rubber tires for farm machinery, machines for sugar beet production, and farm housing.

[Wind erosion control and irrigation investigations] (*U. S. Dept. Agr., Bur. Plant Indus. Rpt., 1935, pp. 8, 26, 27*).—Progress results are briefly presented of investigations on control of wind erosion by proper cultivation, water requirements of crops, subsoil waters, and salinity conditions in soil and irrigation waters, with particular reference to alkali salts and such elements as boron.

Some aspects of research in the Soil Conservation Service, W. C. Lowdermilk (*Soil Conserv.* [*U. S.*], *1* (*1935*), *No. 5, pp. 1–7, figs. 7*).—A brief outline is given of the essential features of the research program of the U. S. D. A. Soil Conservation Service.

[Report of proceedings of the fifth and sixth Southwest Soil and Water Conservation Conferences] (*Southwest Conf. Soil and Water Conserv. Proc., 5* (*1934*), *pp. 55; 6* (*1935*), *pp. 71*).—The proceedings here reported for 1934 comprise presentations of the following discussions: The Essential Character of Water Conservation and Erosion Control, by R. V. Allison (pp. 8–10); Recent Engineering Results of the Federal Erosion Stations of the Southwest, by C. E. Ramser (pp. 10–20); Effect of Organic Matter in the Control of Soil Erosion, by H. J. Harper (pp. 20–23); Recent Developments of Strip Cropping and Water-Furrowing for Erosion Control, by B. H. Hendrickson (pp. 24–26); New Type Terraces and New Terracing Machines, by J. S. Glass (pp. 26–31); What Field of Investigations Should be Entered Into in Order to Develop All Practical Measures of Soil Erosion Control, by C. P. Blackwell (pp. 31–34); Soil Erosion and Land Utilization for Kansas, by F. L. Duley (pp. 34, 35), for Oklahoma, by N. E. Winters (pp. 35–38); for Missouri and Iowa, by R. E. Uhland (pp. 38–41), and for Louisiana, by A. H. Meyer (pp. 41–44); and A Uniform Program of Erosion Control for the Southwest (pp. 44–52).

For 1935 brief summaries are given of recent results at the Red Plains Soil Erosion Experiment Station, Guthrie, Oklahoma, from agronomic experiments by H. G. Lewis (pp. 4–7), and from engineering experiments by H. S. Reisbol (pp. 7–10); at the Soil Erosion Experiment Station, Tyler, Texas, from agronomic experiments in soil and water conservation by B. H. Hendrickson (pp. 10–16), and from engineering experiments by R. W. Baird (pp. 16–20); at the Blackland Soil Erosion Experiment Station, Temple, Texas, from agronomic experiments by E. B. Deeter (pp. 21–24), and from engineering experiments by P. L. Hopkins (pp. 24–27); from agronomic observations and results on soil conservation projects of the Southwest, by N. E. Winters (pp. 28–33), and from engineering experiments by H. O. Hill (pp. 33–39); program of the Soil Conservation Service, by H. H. Bennett (pp. 40–47); results of grass investigations in connection with soil conservation in the Southwest, by B. F. Kiltz (pp. 47–51); wind erosion control and its effect on a planned agriculture, by H. H. Finnell (pp. 51–54); the relation of pond and lake building to water conservation and flood prevention, by W. H. McPheters (pp. 54, 55); pasture development in Texas, by V. W. Woodman (pp. 55–60); and the use of elevating graders in terrace construction, by E. A. Cole (pp. 61, 62).

Terrace outlet control, H. O. HILL (*Agr. Engin., 16 (1935), No. 10, pp. 403–407, figs. 7*).—In a contribution from the U. S. D. A. Soil Conservation Service, the design of terrace outlets is described and tabular data included on the relative costs and advantages and disadvantages of different types of terrace outlet control structures.

Studies of relations of rainfall and run-off in the United States, W. G. HOYT ET AL. (*U. S. Geol. Survey, Water-Supply Paper 772 (1936), pp. 301, figs. 89*).—This is an investigation of relations between annual and monthly precipitation, temperature, evaporation, transpiration, direct surface run-off, groundwater run-off, and infiltration as a basis for the quantitative analysis of the hydrologic cycle over broad areas, and of trends and changes therein; and of relations between storm precipitation and direct surface run-off. An extensive list of references is appended.

Surface water supply of the United States, 1934, Parts 4, 7, 10, 12 C (*U. S. Geol. Survey, Water Supply Papers 759 (1936), pp. VI+159, fig. 1; 762 (1936), pp. V+129, fig. 1; 765 (1935), pp. V+95, fig. 1; 769 (1935), pp. VI+165, fig. 1*).—These papers present the results of measurements of flow made on streams during the year ended September 30, 1934, No. 759 covering the St. Lawrence River Basin; No. 762, the lower Mississippi River Basin; No. 765, the Great Basin; and No. 769, the North Pacific slope basins—Pacific slope basins in Oregon and lower Columbia River Basin.

Drainage of land overlying an artesian groundwater reservoir, O. W. ISRAELSEN and W. W. MCLAUGHLIN (*Utah Sta. Bul. 259 (1935), pp. 32, figs. 9*).—This bulletin constitutes a final report of some phases of drainage studies in Cache Valley, Utah, conducted in cooperation with the U. S. D. A. Bureau of Agricultural Engineering (E. S. R., 69, p. 118).

Field measurements of the direction of flow of water in soils showed that water flows upward through the compact soils overlying the artesian ground water reservoir. The piezometric surface was appreciably lowered by the flowing of water from the artesian wells. It was found physically feasible to pump water out of gravel in large enough streams (and also large enough in total volume) to prevent the flow of water upward and further to permit the flow of excess irrigation water and natural precipitation downward through the upper feet of soil as fast as the low permeability of the soil will permit. Measurement of discharge of water from tile drains in lands east of the artesian area did not show any relationship to the pumping of water from the artesian ground water reservoir. The higher elevation of the piezometric surface in 1932 is believed to be largely due to the increases in precipitation and stream flow and the accompanying increases in the amounts of water percolating naturally from the mountains and the higher irrigated lands into the artesian ground water reservoir.

The conclusion is drawn that extensive pumping of water from the artesian ground water reservoir for a number of years will tend gradually to lower the water table to depths which will prevent further alkali accumulation, permit leaching out the alkali now in the surface soil, and thus gradually improve the soil and increase its productive capacity.

Pumping during only one working day caused a marked lowering of the piezometric surface at six observation wells, one of which was nearly three-fourths of a mile from the pump. The time rate of lowering decreased as the time after starting the pump increased. The piezometric surface rose rapidly after the stopping of the pump, and in one working day it rose almost to its height of the previous day before the pump was started. The time rate of rise decreased consistently as the time after stopping the pump increased. The permeability of the clay surface soil of the waterlogged area was found to be extremely low, whereas the permeability of the artesian ground water reservoir gravels was found to be relatively high, thus showing that it is much more practical to drain by pumping water out of the gravels than to attempt to draw it out of the clay soils by means of tile drains without preventing the upward flow from the artesian reservoir.

Tabular data relating to elevations of piezometric surfaces, drain discharges, and water table depths are appended.

Farm drainage practice, H. B. Roe and J. H. Neal (*Minn. Univ. Agr. Ext. Spec. Bul. 149, rev. (1935), pp. 24, figs. 25*).—Technical information is given on the subject.

Public Roads, [December 1935] (*U. S. Dept. Agr., Public Roads, 16 (1935), No. 10, pp. 201–224+[2], figs. 21*).—This number of this periodical contains the current status of Federal-aid highway projects and U. S. Public Works Program grade crossing projects and road construction, all as of November 30, 1935, and part 3 of an article on The Structural Design of Concrete Pavements, by L. W. Teller and E. C. Sutherland (pp. 201–221) (E. S. R., 74, p. 551).

Forest truck trail handbook: Structures section (*U. S. Dept. Agr., Forest Serv., 1935, pp. III+500–548, figs. 62*).—This section of the 1934 edition of the Forest Truck Trail Handbook includes technical data on bridges, materials, road equipment sheds, powder magazines, portable shops, and cook wagons.

Forest truck trail handbook (*U. S. Dept. Agr., Forest Serv., 1935, pp. [208], figs. 37*).—The purposes of this mimeographed handbook are (1) to prescribe standards for the various classes of minor forest highway projects and of both major and minor forest development projects, (2) to outline in sufficient detail the governing factors in the selection of standards so that as far as possible uniform thought and practice may be secured, and (3) to serve as a reference manual on the location, construction, and maintenance of minor projects.

It contains sections on policy, standards, surveys, construction, explosives, maintenance, and cost keeping and concrete. A large amount of tabular and illustrative material of a technical character is included.

Effect of soil texture upon the physical characteristics of adobe bricks, H. C. Schwalen (*Arizona Sta. Tech. Bul. 58 (1935), pp. 275–294, figs. 7*).—Studies with several soils and mixtures thereof are reported which showed that the selection of an adobe for building purposes cannot be made solely upon the basis of its strength in compression or flexure and its resistance to washing. Other qualities of such practical importance are the amount and seriousness of shrinkage cracking, the ability to withstand rough handling (toughness), and uniformity of size and shape. For these last-named qualities there are no definite standards for comparison or methods to measure their value.

It was found that a soil similar to a gravelly loam with well graded aggregate is required to produce an adobe of highest quality. Adobes may be made from soils covering a wide range in texture, having a clay content varying between 9 and 28 percent depending upon the fineness of soil aggregate. In general, adobes made with soils of high clay content shrink greatly with resulting shrinkage cracks. The addition of coarse sand to a fine-grained soil with high clay content is particularly advantageous in reducing shrinkage and increasing the resistance to washing. Adobe muds have a moisture content of from 1 to 5 percent more than the computed requirements for saturation, varying from 14 to 30 percent in the adobes tested. Air-dried adobes will have a weight of from 100 to 125 lb. per cubic foot, depending upon how well the soil aggregate is graded. The moisture content of air-dried adobes is very low, varying from less than 1 percent to almost 8 percent, and is in general proportional to the clay content.

The average compressive strength of selected adobes made from first-class adobe material may run over 500 lb. per square inch, but a fair value for most selected adobes will be more nearly 400 lb. per square inch. The average for yard-run of adobes will probably be considerably less than the latter figure. The strength of adobes in compression appears to follow the same law as for concrete in that the greater the density the higher the compressive strength. The transverse strengh of adobes is low, and it is of importance principally in that it should be sufficient to withstand the rough handling before the adobes are laid in the wall.

The results of the observations and tests which were made further emphasize the fact that adobes have a lower unit strength than other standard building materials.

Homemade six-volt wind electric plants, H. F. McColly and F. Buck (*North Dakota Sta. Circ. 58 (1935), pp. 16, figs. 4*).—This publication deals with a homemade wind-driven 6-v battery charger system which may be used to generate energy to keep batteries charged for radios, automobiles, tractor lights, and even small lighting systems for farm houses and other farm buildings where the energy consumption is not large.

The construction and operation of this equipment is described.

Rural line construction and operation, F. C. Weiss and L. M. Smith (*Agr. Engin., 16 (1935), No. 12, pp. 481–487, figs. 11*).—A large amount of practical information of a technical character is summarized from the commercial viewpoint.

Lower cost wiring for the farm, M. H. Lloyd (*Agr. Engin., 16 (1935), No. 11, pp. 431–435, figs. 7*).—The results of a series of experiments on lower cost wiring materials are reviewed. These relate to service-entrance cable, including unarmored types with uninsulated neutral conductor, bare ground wire, simplified grounding with a common ground wire and single-driven rod or pipe, simplified service-entrance switch with the meter ahead of the fuses, and the use of nonmetallic sheathed cable in all farm buildings.

A service-entrance capacity formula was developed which represents a method by which the size of entrance wires and switch or circuit breaker is determined by formula instead of the total connected load.

Soil sterilization by electricity, I. P. Blauser (*Agr. Engin., 16 (1935), No. 11, pp. 436–438, 440, figs. 8*).—A brief account is given of experiments begun at the Ohio Experiment Station in cooperation with the Ohio Committee on the Relation of Electricity to Agriculture.

Rubber-tired equipment for farm machinery, G. W. McCuen and E. A. Silver (*Ohio Sta. Bul. 556 (1935), pp. 37, figs. 26*).—Field studies with tractors, farm wagons and trailers, and corn pickers are reported.

The results showed that a tractor equipped with low pressure pneumatic tires has a lower rolling resistance than one equipped with steel wheels and lugs, and the fuel consumption is less than that of one equipped with steel wheels and lugs at the same relative drawbar pull. Under most conditions rubber-tired equipment on tractors is very satisfactory for plowing or for other farm operations. Rubber tires on tractors are ineffective where moist barnyard manure has been spread over the ground. Under favorable conditions rubber-tired equipment will transmit a greater drawbar horsepower than steel wheel equipment in second or third gear and make it possible to use the tractor for many more jobs which could not be done with steel wheel equipment.

The tread of rubber tires does not pick or fill up with surface trash like steel wheels and lugs. Rubber-tired equipment permits higher speeds which generally result in greater fuel economy, and less dust is stirred up by the rubber tires on dry surfaces. With 1,349 hr. of use, there has been no evidence of excessive wear on the tires. During that time only two punctures were experienced.

Under most conditions a tractor equipped with rubber tires is more comfortable for the operator to ride. The elimination of severe shocks and impacts should give the tractor a much longer life. On all rough and soft tractive surfaces the low pressure rubber tire on wagons required the least draft, whereas on smooth, hard surfaces the steel wheel required the least draft. On cultivated soil or meadow the rubber tire will not "cut in" as deeply as the steel wheel and will not damage meadows as badly as will steel wheels.

The width of rim of steel wheels is a factor in cultivated soil, with the wider rim usually having the advantage in draft. A narrow wheel track usually fills in after the wheel has cut through, making it necessary for the rear wheels to cut a new track.

The roller type of bearing required much less draft than the plain or skein type of bearing. On a cinder road the least draft was recorded at a speed of approximately 8 miles per hour for rubber-tired equipment on wagons. Above that speed the draft increased rapidly. A corn picker equipped with rubber tires required much less draft than the same picker equipped with steel wheels. Much less surface trash was picked up by the rubber tires.

Nebraska tractor tests, 1920–1935 (*Nebraska Sta. Bul. 296 (1936), pp. 31, fig. 1*).—This bulletin summarizes the results of 80 tractor tests and includes data on all tractors reported on the market on January 1, 1936 (E. S. R., 73, p. 255).

Measurement of forces on soil tillage tools, A. W. Clyde (*Agr. Engin., 17 (1936), No. 1, pp. 5–9, figs. 8*).—Studies conducted at the Pennsylvania Experiment Station on the soil resistance encountered by tillage tools and the relation of this force to other forces on the tools are reported, the objects being to secure engineering design information on (1) mechanical strength and rigidity, (2) best location for the pulling force, and (3) the effect of different shapes and angles of tools.

The test results reported relate to cultivator shovels, plows, rolling coulters, and disk harrows. It was found in studies of this character that knowledge of the position, direction, and magnitude of the useful soil force on a tillage tool under conditions varying from easy to hard is important, because it is a large part of the total soil reaction on the complete implement. The latter balances the other forces, the most important of which are the pulling force and the weight. Such knowledge is useful as an aid to judgment in designing for strength, for applying the pulling force to the best advantage, and for selecting the best shape of tool for a certain kind or degree of tillage. Two methods, the pulling method and the tillage meter method, are explained, with some mention of important details in their use in locating and measuring soil forces.

For sharp chisel-shaped tools, such as cultivator shovels and plows without rolling coulters, the useful soil force usually has a considerable downward component. Actual values and locations found under some conditions are given. When a rolling coulter is added to a plow it reduces or reverses the vertical component, the amount of change depending on the hardness of the soil and the position of the coulter. The soil resistance may or may not include a couple, the amount and direction of which is affected chiefly by the rolling coulter.

The soil force on an 18-in. disk as used in disk harrows is usually as much or more than the longitudinal force. It apparently always includes a couple. Values and locations of the forces given can be used to check designs with respect to bearings, frames, and weight distribution, as well as for hitching.

Mechanical placement of fertilizers, G. A. Cumings (*Agr. Engin., 16 (1935), No. 10, pp. 396–398, figs. 4*).—In a brief contribution from the U. S. D. A. Bureau of Agricultural Engineering the experiments on mechanical placement of fertilizers conducted in cooperation with several State experiment stations are described.

Tests of flat steel agitator blades, K. R. Frost (*Agr. Engin., 16 (1935), No. 11, pp. 443–445, figs. 6*).—Tests conducted at the California Experiment Station are reported. No conclusions are drawn.

Research work in cotton ginning, C. A. Bennett (*Agr. Engin., 16 (1935), No. 10, pp. 389–395, figs. 7*).—In a contribution from the U. S. D. A. Bureau of Agricultural Engineering, the organization, plan, and equipment of the research program in cotton ginning in progress at Stoneville, Miss., in cooperation with the Mississippi Experiment Station, are described.

The handling, processing, and storing of legume crops for feed, H. E. Richardson (*Agr. Engin., 16 (1935), No. 12, pp. 469–471, figs. 5*).—A summary of the results of various experiments is presented, indicating that alfalfa, regardless of moisture content, can be chopped and stored at no more cost than handling the crop in bulk form, and that chopped alfalfa is more convenient and less expensive to feed out. A ton of chopped alfalfa dry matter requires from one-third to one-half the space necessary for a ton of whole hay dry matter, and the type of storage structure adapted to chopped hay is essentially safer than that required for bulk hay. Serious leaf shattering can be eliminated by handling the crop in uncured form. Of all experimental attempts to reduce loss of nutrients during storage, the low-temperature process offers the most promise of meeting the immediate needs of the average farmer. For safe storage in ordinary mows, chopped hay should be cured fully as well as for whole hay storage. Twenty-five percent average moisture content seems to be about the limit, and 25 percent hay seems to keep better in a mow or ventilated silo than in a tight silo. Legumes containing more than 25 percent moisture require treatment by mineral acids or highly available carbohydrate materials such as molasses. Fifty pounds of molasses per ton of unwilted legumes is apparently satisfactory, and wilted or semicured legumes should probably receive additional water or molasses, or both, as ensiled.

Equilibrium moistures of some hays, F. J. Zink (*Agr. Engin., 16 (1935), No. 11, pp. 451, 452, figs. 3*).—Studies conducted at the Kansas Experiment Station on physical properties of hays of importance in connection with the development of artificial drying equipment are reported. It was found that moisture content is a function of humidity; therefore it should be possible to measure the relative humidity of the enmeshed air, and, by reference to an equilibrium curve of the material involved, establish the moisture content with reasonable accuracy. Such a rapid means of measuring moisture would be very helpful to research work on hay curing.

Data on equilibrium moistures of alfalfa, prairie hay, red clover, and oats straw are presented.

Specific gravity and air space of grains and seeds, F. J. Zink (*Agr. Engin., 16 (1935), No. 11, pp. 439, 440*).—Studies conducted at the Kansas Experiment Station on the specific gravity and air space of grains and seeds as primary factors in their mechanical separation in cleaning and in artificial drying are briefly reported. Methods developed for making these determinations are described and tabular test data presented on both air space and specific gravity of several different kinds of grains and seeds. It was found that specific gravities vary for different stocks of seeds. Air space varies in different storages, depending somewhat on depths of grain, maturity, and other physical differences.

A device for sampling hay, F. J. Zink (*Agr. Engin., 16 (1935), No. 12, p. 478, fig. 1*).—In a contribution from the Kansas Experiment Station, a device for sampling hay is described which is a modified hole saw similar to the round-hole hack saw. It comprises a sampling tube or core saw, and consists of a thin steel tube about 3 in. in diameter by 18 in. in length. The steel used is similar to that used in a carpenter's saw. In one end is secured a standard carpenter's bit shank with which an ordinary carpenter's bit brace may be used, and at the other end of the tube teeth are filed for a cutting edge. Two styles of cutting edges were found necessary to meet all requirements. A large tooth 1 in. long by 0.5 in. deep with knifelike edges was found most suitable for wet hay containing over 20 percent moisture, or for hay which is in the sweat. The diagonal edges were beveled and sharpened, and the tooth-end section was heat-treated for preservation of the cutting edge. A carborundum of whetstone was used for sharpening. A small tooth, similar to that of a 6-point carpenter's saw, was found better for dry hay. In this tube the cutting end was not heat-treated, and the teeth were sharpened by the same means and method as used for sharpening a saw. Each sampler weighed about 3 lb. A 10-in. sweep bit brace was found fairly satisfactory, but a 14-in. sweep bit brace would serve better, especially for sampling wet hay.

[Dust explosion and farm fire investigations] (*U. S. Dept. Agr., Bur. Chem. and Soils Rpt., 1935, pp. 27–29*).—Progress results are briefly presented of investigations on dust explosions and the spontaneous ignition of hay and their prevention.

Precast concrete joists in farm structures, F. A. Lyman (*Agr. Engin., 16 (1935), No. 10, pp. 399, 400, figs. 6*).—This type of construction is briefly described.

Native materials for farm insulation, C. H. Jefferson and C. S. Bryan (*Michigan Sta. Quart. Bul., 18 (1935), No. 2, pp. 75–81, figs. 6*).—Laboratory and field experiments to determine the practicability of sawdust, shavings, and other native materials for insulating farm buildings are briefly reported.

The results show that several readily available native materials, such as sawdust, shavings, peat moss, and ground corncobs, have high insulating value if they can be kept dry. There seems to be no serious objection to using these materials for insulating purposes if some precaution is taken to reduce passage of moisture through the walls, or if the materials are treated with some preservative. Coarse shavings are more desirable than sawdust because they are usually more resistant to decay and do not settle readily. Ordinary hydrated lime dry-mixed with the insulation material seems the most practical preservative to use. It is easy to handle, retards microbial growth, and keeps out rodents. About 2 lb. of lime to every 100 lb. of shavings or about 0.25 lb. of lime to a bushel of shavings is a suggested proportion. These native materials are not suggested as a substitute for commercial insulation in all cases, but where they are available they are said to offer an economical solution to the problem of insulating all types of farm buildings.

A heat insulated greenhouse, L. C. Porter (*Agr. Engin., 16 (1935), No. 12, p. 487, figs. 4*).—Experiments on a greenhouse, so constructed as to have its sides, ends, floor, and half of the roof made of heat-insulating materials entirely opaque to light, are briefly reported.

The single row of sash on one side of the roof was made of large panes of glass 24 in. wide by 32 in. long, set in putty and pointed to form airtight joints. In order to admit the maximum amount of light during the winter months when daylight and sun intensities are lowest, the sash was set at an angle of 52.5° to the horizontal.

The house was equipped with 300-w Mazda lamps, and the heat from these lamps was the only heating, aside from the radiant energy of the sun, used in the house. The lamps were controlled by a thermostat set to maintain the temperature between 62° and 68° F. In general, the total lighted period was about 4 hr. in each 24.

Various flowers were raised in this house in comparison with similar plants raised in a conventional all-glass type of greenhouse. The plants in the heat-insulated greenhouse grew larger and faster than the controls. Snapdragons, for example, bloomed 8 weeks earlier in the heat-insulated house than in the regular one. The dry weight of buckwheat plants grown between December 10 and January 25 was almost three times that of similar plants raised in a regular greenhouse.

Electric uses in the greenhouse, W. C. Krueger (*Agr. Engin., 16 (1935), No. 12, pp. 475-478, figs. 2*).—This paper, a contribution from the New Jersey Experiment Stations, summarizes the applications of electrical energy to greenhouse production practices.

The pen barn and separate milking room, H. F. McColly and J. R. Dice (*North Dakota Sta. Bul. 283 (1935), pp. 26, figs. 22*).—Technical information is given relating to the planning, design, and construction of the pen barn system for dairy cattle. This system allows the cows to run loose in the barn except when they are being milked. Box stalls are provided for calves, bulls, and cows at calving time or when sick. The cows may be milked in a separate milking room where two or more stalls are provided. They are fed their grain in the milking room at milking time and are usually fed their roughage in the pen from a rack and manger. The milking room is located so that the cows can be herded into one pen and admitted to the milking room, two, three, or four at a time, and after milking are put into another pen. From 25 to 50 percent more straw is required for pens than for stalls in a standard dairy barn, but usually the cows will keep cleaner than in stanchions. This system is adapted to herds of 10 or more head. If the herd is smaller than this the saving in stall equipment and the other advantages are usually not great enough to warrant not having a stall for each cow.

Details of structural design are presented, including especially those relating to roof trusses and bracing.

An electric heater for the milking room of the pen type dairy barn, O. E. Robey (*Michigan Sta. Quart. Bul., 18 (1935), No. 2, pp. 117–120, figs. 3*).—This equipment is described and its essential features illustrated. The heater is enclosed in a U-shaped pipe made of galvanized iron. An electric fan draws in the cold air at the bottom and blows it through the electric heaters at the middle of the pipe. The warm air is then delivered near the ceiling from the upper end of the pipe. On the outside of the pipe at its center the control device is located. The control mechanism consists of an electric clock and the necessary relays. Ten 650-w heaters were used to heat the air. These were connected in five pairs, each two heaters being connected in series across a 220-v line.

Tests of the heater indicated that it would deliver 200 cu. ft. of air per minute with a temperature rise of 63°. Theoretically, this should heat air in the room through a 40° temperature rise in about 15 min., with no radiation through the walls of the building. In practice, it took about 0.5 hr. to accomplish this result.

The heater has satisfactorily eliminated the condensation problem, and has provided comfortable conditions at milking time.

The energy required in the cooling of milk, J. E. Nicholas (*Agr. Engin., 16 (1935), No. 12, p. 474, fig. 1*).—In a contribution from the Pennsylvania Experiment Station data on the energy required per 10-gal. can of milk to cool to different lower limits from the same initial temperature are presented.

Cooling milk with ice, J. E. Nicholas (*Agr. Engin., 16 (1935), No. 12, pp. 472–474, figs. 4*).—Studies conducted at the Pennsylvania Experiment Station on the wet and dry types of milk coolers are reported.

It was found that the dry type of cooler is more economical in operation than the wet type for equal amounts of insulation, and that the wet type tank must be re-iced more frequently when used to full capacity. Milk cools more rapidly and uniformly in the wet type of tank. Since ice is used as a source of refrigeration and maintains the cooling water between 33° and 38° F., on the average, it would be economical to use more than 3 in. of insulation in both types of tanks. The temperature to which the milk will cool during the night cannot be controlled so long as there is available ice in either type tank, unless the milk is removed after it has cooled from 2 to 6 hr. The cooling water must be changed more frequently with wet type tanks, and the ice compartments should be scrubbed and rinsed before every re-icing.

The Wyoming straw-loft poultry house, M. O. North (*Wyoming Sta. Bul. 211 (1935), pp. 15, figs. 6*).—Practical information is given on the construction of the Wyoming straw-loft poultry house, together with drawings and a list of materials for a 20- by 20-ft. section.

Egg production tests are briefly reported indicating the effectiveness of this type of structure for maintaining the producing ability of birds throughout the winter. Other data indicate the insulating ability of the structure.

Modernizing farmhouses, W. Ashby and W. H. Nash (*U. S. Dept. Agr., Farmers' Bul. 1749 (1935), pp. II+62, figs. 66*).—This publication presents examples of modernizing that have been accomplished, alternate plans for some of these situations, and plans for some typical conditions not represented by the other examples.

AGRICULTURAL ECONOMICS

Proceedings of the Third International Conference of Agricultural Economists, 1934 (*[New York and] London: Oxford Univ. Press, 1935, pp. XI+498, pls. 2, figs. 48*).—Included are the papers presented at the Conference held at

Bad Eilsen, Germany, August 26 to September 2, 1934. The papers are grouped according to the four sections of the program as follows:

National policies in agriculture—the forms ,stages, and limits of planned economy.—Planning Measures for the Protection for British Agriculture, by J. P. Maxton (pp. 40–47); Measures Taken to Combat the Crisis in Swiss Agriculture, by E. Laur (pp. 48–59); Measures for Combating the Agricultural Crisis in Germany, by C. von Dietze (pp. 60–77); Italian Agriculture and the Crisis, by G. Tassinari (pp. 78–86); Regulation of Agricultural Production in Holland, by S. L. Louwes (pp. 87–96); Fighting the Crisis in the Peasant Countries of the Danube Basin, by O. von Frangeš (pp. 97–107); Economic Conditions of Peasants in British India, by S. C. Ray (pp. 108–119); Problems and Policies of Canadian Agriculture, by J. E. Lattimer (pp. 120–134); The Agricultural Situation in U. S. A., by O. C. Stine (pp. 135–154); Discussion, by L. Herrmann (pp. 155–164); and German Experience of War Food Administration, by F. von Falkenhausen (pp. 165-177).

Social and economic aspects of farm organization.—The Formation of New Small Holdings in Italy after the War, by G. Lorenzoni (pp. 178–192); The Family Farm, by A. W. Ashby (pp. 193-206); The Farm and Farm Family as Social Institutions, by P. Borgedal (pp. 207–217); Discussion on the Small Farm System, by G. F. Warren (pp. 217, 218); Collective and State Farming in Russia, by E. Lang (pp. 219–230); Fundamental Problems of Collective Farming, by O. Schiller (pp. 231-236); An Experiment in Co-operative Machinery-Employment by Peasant Farmers, by A. Münzinger (pp. 237–243); and Discussion on Collective Farming, by A. Schürman (pp. 244–249).

Population growth and agriculture.—The Population Prospect, by P. K. Whelpton (pp. 250–263); and Agricultural Implications of the Population Prospect in U. S. A., by O. E. Baker (pp. 264–288).

International policies relating to agriculture.—The Monetary Situation, by G. F. Warren (pp. 289-309); The Currency Problem of Our Time, by H. Schumacher (pp. 310-322); Stabilization of the General Price-Level by International Valorization of Wheat, Sugar, Cotton, Coffee, and Rubber, by M. D. Dijt (pp. 323–339); The International Debt and Credit Problem, by H. Schacht (pp. 340–395); International Debts and Their Influence on Agricultural Prices, by R. R. Enfield (pp. 396–404); Discussion on International Monetary and Credit Problems, by S. Schmidt, E. M. H. Lloyd, Solmssen, A. W. Ashby, and G. F. Warren (pp. 404–414); New Tendencies in International Trade Politics, by E. Winter (pp. 415-424); The Economic Significance of Regional Pacts, by O. von Frangeš (pp. 425–434); International Schemes for Regulation of Supply, by E. M. H. Lloyd (pp. 435-445); and International Planning for Agricultural Production, by H. C. Taylor (pp. 446–457).

Also included are the addresses of welcome by L. K. Elmhirst, M. Sering, K. Meyer, and G. F. Warren; the concluding speeches of E. Laur, G. F. Warren, and M. Sering; and papers on Agriculture in Germany, by H. Zörner (pp. 9–22), and The World Economic Crisis, by M. Sering (pp. 23–39).

Appendixes include the report of a special group meeting on milk marketing regulation in the United States by M. C. Bond, in Germany by O. Vopelius, and in Great Britain by A. W. Ashby; a list of reports on the economic conditions and political developments in various countries circulated in advance of the Third International Conference; a list of persons attending the Conference; and a brief history of the Conference, its constitution, and a list of officers and members.

[Papers on agricultural economics] (*Jour. Farm Econ., 17 (1935), No. 4, pp. 646–701*).—Included are a paper by A. Serpieri on The National Institute of

Agricultural Economics in Italy (pp. 646–658), one by W. H. Ebling on The Field of Agricultural Data (pp. 659–668), and the following, with discussions thereon, as presented at the meeting previously referred to (E. S. R., 73, p. 258): Tax Relief Through Rational Expenditure Control, by H. L. Lutz (pp. 669–681); and Studies of Local Government as an Approach to the Question of Farm Taxation, by M. P. Catherwood (pp. 682–701).

[Investigations in agricultural economics] (*Jour. Farm Econ., 17 (1935), No. 4, pp. 732–753, figs. 4*).—Notes are included on Problems of Creamery Operating Efficiency in California, by J. M. Tinley (pp. 732–735); Some Factors Affecting Butter Consumption, by J. B. Roberts (pp. 735–738); The Direct Marketing Controversy, by F. L. Thomsen (pp. 738–741); Some Recent Economic Trends of Concern to Midwest Cooperatives, by F. Robotka (pp. 741–748); and Comments on Views of the Economic Committee of the League of Nations on Agricultural Protectionism, by E. Laur (pp. 748–753).

General economic research [of the Bureau of Agricultural Economics, 1935] (*U. S. Dept. Agr., Bur. Agr. Econ. Rpt., 1935, pp. 16–25*).—Data are reported as derived from studies of baggings used to cover cotton bales, the cost of using tractors, motor trucks, and combined harvester-threshers in the Great Plains and northwest wheat country; a survey of agricultural conditions in that part of Kansas lying south of the Cimarron River; farm real-estate taxes and rural tax delinquency; bank loans in agricultural areas; seed loan borrowings; gross margins of hog slaughterers; the Louisiana strawberry situation; market movement by motor truck; the effects of processing taxes; land utilization in "distress areas" and the old-plantation piedmont cotton belt of Georgia; and improvements in the farm real-estate situation.

[Investigations in agricultural economics by the Maryland Station, 1933–34] (*Maryland Sta. Rpt. 1934, pp. IX, X, XVII, XVIII*).—Included are some data regarding farm real estate tax delinquency, 1928–32, and a table showing the yield, value, cost of production, and net value per acre of different crops on the station farm in 1933.

[Investigations in agricultural economics at the Ohio Station] (*Ohio Sta. Bimo. Bul. 177 (1935), pp. 213–215, fig. 1*).—Index Numbers of Production, Prices, and Income, by J. I. Falconer (E. S. R., 74, p. 272) are brought down through August 1935. Also included is an article by F. L. Morison, Rotation Pasture in Ohio, with a map showing the percentage of rotated farm areas in the State in rotation pasture, 1929–33.

A list of American economic histories, E. E. Edwards (*U. S. Dept. Agr., Library, Bibliog. Contrib. 27 (1935), pp. III+25*).—This supplements Bibliographical Contribution 26, noted below.

References on the significance of the frontier in American history, E. E. Edwards (*U. S. Dept. Agr., Library, Bibliog. Contrib. 25 (1935), pp. VII+63*).—This bibliography consists of articles and books, including material on analogous conditions in other countries.

Selected references on the history of agriculture in the United States, E. E. Edwards (*U. S. Dept. Agr., Library, Bibliog. Contrib. 26 (1935), pp. V+28*).—This bibliography supplements earlier data, in part previously noted (E. S. R., 64, p. 386).

Selected references on the history of English agriculture, E. E. Edwards (*U. S. Dept. Agr., Library, Bibliog. Contrib. 24 (1935), pp. III+42*).—Lists of bibliographies and histories are included.

International problems of agriculture (*Roma: Internatl. Inst. Agr., 1935, pp. [5]+80*).—Part I includes a brief history of the International Institute of Agriculture and descriptions of its purpose and its departmental and general organization. Part II includes the memorandum of the United States submitted to the XIIth General Assembly on trade barriers, commercial treaties, and long-time planning, and the discussion thereon in the General Assembly. Part III includes the recommendations on reorganization of statistical, economic, and legal services of the Institute presented to the XIIth General Assembly by H. C. Taylor, delegate from the United States, the discussion thereon in the General Assembly, and its recommendations.

Commodity control in the Pacific area: A symposium on recent experience, edited by W. L. Holland (*Stanford Univ., Calif.: Stanford Univ. Press, [1935], pp. 452, figs. 7*).—"This book had its origin in the discussions at the Banff Conference of the Institute of Pacific Relations held in August 1933." The following articles are included: Planned Agricultural Adjustment in the United States, 1933–1934, by J. S. Davis (pp. 17–89); Stabilization Operations of the Federal Farm Board, by E. S. Haskell (pp. 90–124); The Canadian Wheat Pool in Prosperity and Depression, by H. S. Patton (pp. 125–156); The Japanese Rice Control, by S. Tobata (pp. 157–197); Silk Control in Japan, by T. Mori (pp. 198–223); Control in the Australian Sugar Industry, by J. B. Brigden (pp. 224–265); Co-operation in the Hawaiian Pineapple Business, by R. N. Chapman (pp. 266–278); Commodity Control in Netherlands India, by C. G. H. Rothe (pp. 279–319); Export Control Boards in New Zealand, by R. G. Hampton (pp. 320–335); Control of Primary Commodities in Australia, by G. L. Wood (pp 336–348); Petroleum Control in the United States, by B. Bryan, Jr. (pp. 349–375); The International Tin Restriction Plan (pp. 376–398) and The International Control of Rubber (pp. 399–425), both by O. Lawrence; and International Conservation of Fisheries in the North Pacific, by R. A. Mackay (pp. 426–448).

[**The agricultural situation, 1935**] (*U. S. Dept. Agr., Sec. Agr. Rpt., 1935, pp. 1–55, 64–84, 109–112*).—This portion of the report to the President of the United States presents and discusses the present agricultural situation, the operation of the Agricultural Adjustment Administration programs, and the work of the Department under the following headings: Farm recovery aiding general recovery, permanent agricultural adjustment, suits against the Agricultural Adjustment Administration, foreign trade and its alternatives, significance of farm imports, dual-price systems, farm income, agricultural credit, farm-land values, rural-urban balance, aftermath of the drought, land utilization, cotton, wheat, the livestock situation, dairy products, tobacco, sugar, rice, poultry and eggs, rye, and economic research and service.

Regional problems in agricultural adjustment (*U. S. Dept. Agr., Agr. Adjust. Admin., 1935, pp. III+101, pl. 1*).—This publication, prepared in the Program Planning Division of the Agricultural Adjustment Administration, includes a map showing regionalized types of farming in the United States and chapters on fitting adjustment plans to the farm, volume of national production desired, regional distribution of agricultural production, the Corn Belt and the meat-animal feed-grain problem, the Cotton Belt and the cotton problem, adjustment problems in the tobacco areas, the wheat regions and the wheat problem, the dairy regions and the dairy problem, the range-livestock regions, the mixed farming regions, the fruit, truck, and special crops regions, self-sufficing farming and the submarginal-land problem, and developing a regional adjustment program.

A basis for regional agricultural adjustments in Ohio (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 83 (1935), pp. 28, fig. 1*).—The purpose of this study was to devise a method of determining desirable changes in the crop and livestock system of the State, and to estimate the effect of such changes on the agricultural income. Using soil and erosion maps of the State, census data, type-of-farming studies, and corn-hog contract data, the State is divided into 15 areas. The areas are described and possible adjustments in each discussed.

Major land-use problem areas and land utilization in Ohio, 1935, J. H. Sitterley, R. H. Baker, and J. I. Falconer (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 79* (*1935*), *pp.* [*5*]+*26*+*71*, *figs. 35*).—Part I describes and discusses the different land-use problem areas and the State and national forest acquisition areas in the State. Part II presents some of the significant physical, economic, and social factors related to land-use, and includes as part of the discussion short articles as follows: Erosion in Ohio, by A. H. Paschall; Primary Vegetation Areas in Ohio, by E. N. Transeau and H. C. Sampson; and Population Redistribution in Ohio, 1888–1930, by G. H. Smith.

How farmers adjust when prices fall, D. R. Mitchell (*Wisconsin Sta. Bul. 431* (*1935*), *pp. 30, figs. 6*).—Analysis is made of detailed cost records on 40 La Crosse County farms for 1931 and 1932. Some of the changes in the averages from 1931 to 1932 were: Total receipts —$1,162, receipts from crops —$315, receipts from livestock and livestock products —$762, miscellaneous receipts —$34, family living from the farm —$51, total expenses —$1,330, investment expenses —$735, operating expenses —$602, crop acreage +0.5 acre, crop yields +16 percent, number of livestock units +1.2, pounds butterfat produced +1.5 percent, pounds pork produced +10.6 percent, dozen eggs produced +13.1 percent, value of materials used in crop production —$176, livestock expenses —$16, pounds of dairy rations purchasable with 10 lb. of butterfat +12, pounds of hog rations purchasable with 100 lb. pork —94, pounds of poultry rations purchasable with 10 doz. eggs +34, personal and household expenses —$378, amounts of farm products consumed by a family—milk +244 lb., beef +270 lb., pork +176 lb., eggs +37 doz., present worth of farms —$1,734, and labor income +$168.

Farm organization and management [in Maryland] (*Maryland Sta. Rpt. 1935, p. XI*).—A brief summary is given of the average receipts, expenses, and labor income found in a 3-yr. study of 180 dairy and 100 poultry farms in the State.

Semi-annual index of farm real estate values in Ohio, January 1 to June 30, 1935, H. R. Moore (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 85* (*1935*), *pp. 4*).—This is a continuation of the series previously noted (E. S. R., 73, p. 403).

Farm tax delinquency in Michigan from 1928–1932, W. O. Hedrick (*Michigan Sta. Spec. Bul. 264* (*1935*), *pp. 62, figs. 20*).—Analysis is made of data for the period 1928–32 gathered in cooperation with the Bureau of Agricultural Economics, U. S. D. A., on delinquencies of 32,345 rural properties in 8 counties. The purpose of the study was to determine the growth and extent of such delinquency, the extent to which back tax arrears have been cleared off before the tax sale date, the extent to which farmers have lost properties through tax sales and the ratios of such losses to the delinquencies, and the extent to which rural tax sale lands defaulting to the State due to lack of private buyers are made up of arable farm lands. The types of tax relief and remedial measures resorted to under emergency conditions are described, and their effects in relation to revenues, administration, and taxpaying and tax-redeeming capacity are discussed.

In the 142 rural townships the property tax delinquencies increased from 5 to 10 percent of the tax levies in 1928 to 30 to 35 percent of the levies in 1932. Farm tax sales increased from 1,862 to 3,439. Back tax payments decreased from 52 percent of the delinquencies in 1928 to 26 percent in 1931, and then increased to 39 percent in 1932. In 1928 70 percent and in 1932 91 percent of the sales went to the State in the form of "tax bids." Relief measures attempted were reduction in levies, tax rates, and assessed valuations, remission of penalties, deferring of dates of sale, and amortization of delinquencies during a 10-yr. period. There was some evidence that the suspension of penalties was a direct cause of increased delinquency through the uncertainty developed as to tax collections.

Forest taxation in the United States, F. R. FAIRCHILD ET AL. (*U. S. Dept. Agr., Misc. Pub. 218 (1935), pp. 681, figs. 11*).—"The Forest Service has, over a period of years, made an exhaustive investigation of this subject through a staff of economists and foresters under the immediate direction of a leading taxation economist. This report contains the more important results of that investigation. It presents a background of facts about the existing methods of taxation and their relation to forestry. It weighs the effects of taxation on forest management. It develops the principles of sound forest taxation. Concrete proposals for applying these principles are offered. These proposals are based on the requirements of the public interest both in forestry and in taxation."

Part 1 (pp. 3–15) describes the origin, organization, scope, plan, and method of the study. Part 2 (pp. 17–38) describes the financial organization and finances of the Federal Government, States, counties, towns, other subordinate Government units, and forest and agricultural communities. Part 3 (pp. 39–76), Theory of Forest Taxation With Special Reference to The Property Tax, discusses the relation of taxes to "annual sustained yield", "deferred yield", and "depletion yield", and to the value of forest investments, and makes mathematical analysis of the income tax, unmodified property tax and its relations to different kinds of forest, certain modifications of the property tax for deferred- and sustained-yield forests, and the yield tax. Parts 4 (pp. 77–150) and 5 (pp. 151–197), respectively, discuss the procedure in different States in making tax assessments and apportionments, and tax collection and delinquency. Part 6 (pp. 199–224) deals with the property tax base and the place occupied by forests in this base. Part 7 (pp. 225–279), The Property Tax Burden and Its Effects on Forest Management, analyzes the property tax burden on forests and its effect on forest management, presenting statistical and theoretical evidence that in general deferred yield forests are subject to a greater burden than most other types of property. Part 8 (pp. 281–339) discusses the absolute burden of taxes due to the existing forms of political organization and the functioning of Government. Part 9 (pp. 341–404) reviews the history of special forest taxation laws in the United States. Part 10 (pp. 405-419) discusses the relation of Federal and State income, death, and severance taxes to forestry. Part 11 (pp. 421–519) describes the taxation of forests in Great Britain, France, Germany, Switzerland, Sweden, Norway, and Finland, and discusses the application of European experience to the United States. Part 12 (pp. 521–640) reviews the forest-taxation problem in the United States, and makes recommendation as to possible methods for correction of conditions. An extensive bibliography is appended.

The forest-tax problem and its solution summarized, R. C. HALL (*U. S. Dept. Agr. Circ. 358 (1935), pp. 18*).—This is a condensed statement of the more important phases of the bulletin noted above.

Correct and incorrect methods of determining the effectiveness of the tariff, H. SCHULTZ (*Jour. Farm Econ., 17 (1935), No. 4, pp. 625–645, fig. 1*).—The equilibrium method, the criticisms of the Wisconsin Tariff Research Committee of this method, and the price differential method are analyzed and discussed. The paper is discussed by R. R. Renne.

Farm mortgages and the Government, W. G. MURRAY (*Jour. Farm Econ., 17 (1935), No. 4, pp. 613–624*).—This contribution from the Minnesota Experiment Station discusses the farm mortgage lending legislation and the operations thereunder of the Federal Government.

"In conclusion, farm mortgage history of the past few years points definitely toward continued governmental sponsorship. As long as such sponsorship does continue, much will depend on able leadership in the Farm Credit Administration. This organization, it appears, is facing a dilemma in that the more efficiently it perform its task the more difficult and involved may become the lending activities that Congress will call on it to administer. One of these difficulties with the system since its inception is, as has been shown, preventing the Federal land banks from overloading themselves with farm mortgages in the high-interest, high-risk areas because it is in these regions that the Federal system with its interest rate subsidy is most attractive to borrowers."

Labour in agriculture: An international survey, L. E. HOWARD (*[New York and] London: Oxford Univ. Press, 1935, pp. XIV+339*).—"This book is based principally on work done by the Agricultural Service of the International Labour Office, namely, on information dealing with agricultural labour prepared by members of the Service and set forth in the official publications of the Office." The material is analyzed in chapters on the basic laws, the kaleidoscope of modern agriculture, the agricultural populations, the agricultural labor contract in the United States, Canada, Australia, New Zealand, and in Europe, the agricultural labor codes, hours of work, housing, education, rights of association and combination, collective bargaining, and the agricultural trade union movement, agricultural wages, the efficiency of agricultural labor, labor demand and opportunities of employment, and final remarks and suggestions.

Tractor versus horse as a source of farm power, N. JASNÝ (*Amer. Econ. Rev., 25 (1935), No. 4, pp. 708–723, figs. 3*).—The items of cost in horse and tractor work, the proportion of fixed and variable charges, the amounts of labor required, and the indirect effects of the wage level are discussed. The conditions favorable and unfavorable to tractor utilization in different agricultural districts of the United States and in Canada, Argentina, Australia, and different European countries are briefly summarized.

The annual work per horse is a more important factor than the relation of costs of horses and feed to costs of tractors and fuel. The saving on labor with tractors is less important than the variation in the annual amount of work per horse. The same is true for other factors affecting the variation in the use of tractors, i. e., size of farms, seasonal distribution of power and labor requirements, skill of tractor operators, topography, soils, etc.

Report of the Chief of the Grain Futures Administration, 1935, J. W. T. DUVEL (*U. S. Dept. Agr., Grain Futures Admin. Rpt., 1935, pp. 8*).—Included are tables showing the volume of trading in different grain futures on different markets, the volume of futures settled by delivery, and the open commitments of corn and wheat futures semimonthly during the year. Data are also included regarding the classification of futures traders, litigation, and pending legislation.

Financial operations of Ohio farmer owned elevators during the fiscal year 1934–35, B. A. WALLACE (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 84 (1935), pp. 16, fig. 1*).—This is the seventh number of a series previously noted (E. S. R., 72, p. 407). It is based upon the main balance sheets and income and expense items of 180 plants; detailed analysis of expenditures of 46 companies; commodity sales and margins for 33 companies; and month by month figures of charges, collections, and balance of accounts receivable of 15 companies.

Beef feeding costs and returns in Michigan, 1933–34, K. T. WRIGHT (*Michigan Sta. Quart. Bul., 18 (1935), No. 2, pp. 81–86*).—This study was undertaken to obtain information on the cost of fattening steers and to compare the returns from different methods of feeding and management. A total of 15 steer feeders cooperated in keeping the necessary records.

A comparison was made of the five feeders making the highest return with the five feeders making the lowest return. The first group purchased their steers in February (3 mo. later than the second group), paid $1.30 per hundredweight less for the animals, had a lower death loss, fed their steers 64 days less, fed 25 percent less concentrates per pound of gain, and had a margin of 74 ct. per hundredweight greater than the second group. The first group had a return of $1.38 for every dollar of feed fed as compared with a return of $1.10 for the second group.

The livestock auction in Ohio, P. S. ECKERT and G. F. HENNING (*Ohio Sta. Bul. 557 (1935), pp. 27, figs. 2*).—Data were obtained by interviews with someone connected with each auction sale held during the summer of 1934. Tables are presented and discussed covering the date of organization, reasons for organizing, location, date, importance, volume of sales, business organization, financing, etc., of auction sales in Ohio, the methods of handling and selling livestock, and the consignors and buyers of different kinds of livestock. A section on the farmers' viewpoint is based on 462 answers to a questionnaire.

Meat cutting and pricing methods, A. T. EDINGER (*U. S. Dept. Agr., Bur. Agr. Econ., 1935, pp. [2]+40, figs. 4*).—Using data gathered by the Bureau on the approximate yields of various retail cuts obtained from beef, lamb, and veal carcasses, and of wholesale cuts from a hog carcass, and on the relationships of the prices of different cuts, tables are included showing how retail prices of different cuts can be determined so as to realize a given gross percentage margin on the basis of either cost or sales.

An economic survey of the baby chick hatchery industry, E. L. WARREN and M. T. WERMEL (*U. S. Dept. Agr., Agr. Adjust. Admin., 1935, pp. VI+64, figs. 9*).—The geographical distribution and interstate character of the industry, functions of hatcheries and hatching efficiency, the cost of chick production, and the margin of profit in the hatchery industry are discussed.

Creamery operating efficiency in California, I, II, J. M. TINLEY, F. H. ABBOTT, O. M. REED, and J. B. SCHNEIDER (*California Sta. Mimeogr. Rpt. 41 (1935), pp. 82, figs. 8*).—This is the first of several mimeographed reports on the study of creamery efficiency in California.

Part I, entitled General Introduction to the Study, presents the problems involved, the sources and nature of the data collected, accounting problems involved, and enumerates the factors that may influence the efficiency of operation of business enterprises such as creameries. Part II, entitled Utilization of Labor and Labor Costs, deals in considerable detail with the factors responsible for the differences in the number of hours of labor and labor costs per unit of butter, casein, skim milk powder, and dry buttermilk.

Factors affecting the price of market milk in San Francisco, J. M. TINLEY (*California Sta. Mimeogr. Rpt. 43 (1935), pp. 31, figs. 4*).—This is a statement prepared for presentation at the hearings on September 30, 1935, on the proposed stabilization and marketing plan for fluid milk in the San Francisco marketing area.

An analysis of the prices received for canned asparagus by canners in California—seasons, 1925–26 through 1934–35, H. J. STOVER (*California Sta. Mimeogr. Rpt. 40 (1935), pp. 15, figs. 6*).—This study was made to determine the more important factors responsible for annual average f. o. b. prices, and to measure the influence of several factors on the prices. Tables and charts show the relation of shipments, trend of demand, consumer's income, etc., and prices, and between actual prices and prices estimated from the relationships between actual prices and important factors affecting them.

An analysis of the prices received for canned peaches by canners in California—seasons, 1922–23 through 1934–35, H. J. Stover (*California Sta. Mimeogr. Rpt. 42* (*1935*), *pp. 17, figs. 6*).—The results are presented of an analysis made to determine the more important factors responsible for the variations in the average f. o. b. prices received by canners in California for canned peaches and to measure the effects of these factors on prices.

Supply and price trends in the California wine-grape industry.—II, A statistical summary, S. W. Shear and G. G. Pearce (*California Sta. Mimeogr. Rpt. 34* (*1934*), *pt. 2, pp.* [*63*], *figs. 17*).—This is a statistical summary including graphs and tables on consumption, production, imports, exports, and prices of wine, brandy, and wine grapes for the United States, with special reference to California.

Fruits and vegetables received in trucks in the Columbus wholesale market 1929–1934, C. W. Hauck (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 80* (*1935*), *pp.* [*2*]+*27, figs. 7*).—Data are included on truck and rail receipts, commodities received, sources of truck receipts, daily and seasonal receipts by trucks, and value of truck receipts.

Cost of marketing fruits and vegetables in the Columbus wholesale curb market, C. W. Hauck and H. E. Larzelere (*Ohio State Univ., Dept. Rural Econ.* [*Mimeogr. Bul.*] *78* (*1935*), *pp. 27, figs. 2*).—This study was undertaken to ascertain the costs of growers selling locally grown fruits and vegetables in the municipal wholesale curb market at Columbus, to determine the labor income of such growers for the time spent in marketing, and to compare their costs with the customary charges for similar functions when performed by established wholesaling and jobbing agencies.

Marketing Ohio grapes, C. W. Hauck (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 81* (*1935*), *pp. 40, figs. 7*).—Data are presented as to acreages, production, prices, carlot shipments, unloads in different markets, etc., in the United States and Ohio and as to wineries in Ohio. Analysis is made of data obtained from 183 commercial grape growers in northern Ohio in regard to acreages, production, varieties, sales, and attitude of growers toward various proposals for marketing. Analysis is also made of data obtained from more than 12,000 families in Cleveland regarding grape-buying practices. Suggestions are made for the improvement of the marketing of Ohio-grown grapes.

Five years of cannery tomato inspection in Ohio, 1930–1934, C. W. Hauck (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 82* (*1935*), *pp.* [*15*], *figs. 6*).—The results of purchasing cannery tomatoes on United States grades for cannery tomatoes by from 5 to 16 commercial canners during the years 1930–34 are discussed.

Wholesale prices at Cincinnati and New York, H. E. White ([*New York*] *Cornell Sta. Mem. 182* (*1935*), *pp. 42, figs. 19*).—"The purpose of this study is to show the movement of wholesale prices of individual commodities and of groups of commodities at Cincinnati and New York for the 71-yr. period from 1844 to 1914, inclusive." Using the wholesale prices at Cincinnati obtained from the weekly Cincinnati Price Current and the Cincinnati Daily Price Current, monthly index numbers were prepared and are included for the years 1844–1914 for farm products, foods, hides and leather, textiles, fuel and lighting, metals and metal products, building materials, and miscellaneous products, wholesale prices of all commodities, livestock, meats and meat products, grains, fruits and vegetables, cotton goods, and furs. Charts included and discussed show the relations of these index numbers and those for wholesale prices at New York City of individual commodities obtained from an unpublished manuscript of G. F. Warren and F. A. Pearson, and for groups of commodities included in [New York] Cornell Station Memoir 142 previously noted (E. S. R., 69, p. 296).

Monthly receipts from the sale of principal farm products, by States, with rental and benefit payments, January 1929 to December 1934, C. M. Purves and N. Koffsky (*U. S. Dept. Agr., Bur. Agr. Econ., 1935, pp. 125*).—Tables show by months 1929–34, by States, and for the United States, the receipts from the sale of crops, the sale of livestock and livestock products, and rental and benefit payments. The changes in cash receipts and the seasonal trends of such receipts in the different geographic regions are briefly discussed.

The margin between farm prices and retail prices of ten foods, F. V. Waugh (*U. S. Dept. Agr., Bur. Agr. Econ., 1935, pp. [2]+11+[21], figs. 12*).—Tables and charts show by months, January 1913 to February 1935, inclusive, and by years 1910–34, the farm prices of beef cattle, hogs, hens, eggs, dairy products (48 lb. of milk and 2.04 lb. butterfat), potatoes, and wheat; the retail prices of beef cuts, pork, hens, eggs, dairy products (19.5 qt. milk, 2½ lb. butter, and 0.6 lb. cheese), potatoes, flour, and bread; the margins between two prices and a comparison of the amount paid by a typical workingman's family for a monthly supply of food (14.8 lb. beef, 12.1 lb. pork, 2 lb. hens, 5.1 lb. butter, 1.2 lb. cheese, 58.8 lb. potatoes, 21.7 lb. flour, 32.9 lb. bread, 5.1 doz. eggs, and 39.8 qt. milk), and the amount received by farmers for the products required for these quantities used by the consumer (beef cattle 32 lb., hogs 23 lb., hens 2.22 lb., eggs 5.1 doz., milk 204 lb., potatoes 0.98 bu., and wheat 1.04 bu.).

The problem of lags and the reason for changes in the spreads are discussed briefly.

RURAL SOCIOLOGY

The growth of population in Louisiana, 1890 to 1930, T. L. Smith (*Louisiana Sta. Bul. 264* (*1935*), *pp. 53, figs. 20*).—This bulletin is the first of a series presenting the findings from a study of Louisiana's population and covers the period 1890-1930. It was found that the population of the State increased 87.9 percent during that period as compared with an increase of 95 precent for the United States as a whole, and that less than 2 percent of the State's population in 1930 was foreign born.

The rate of population increase varied greatly in different sections of the State. The greatest gains were made in urban districts and contiguous territory, the "cut-over" sections, the rice growing area, the small fruit and trucking area, three parishes in northeastern Louisiana, and one parish in northwestern Louisiana. While the population of the State was almost doubled, decided losses occurred in the "Sugar Bowl" parishes and the Plaquemines Parish on the Mississippi below New Orleans. The distribution of gains and losses was such that increasing portions of Louisiana's farming population have come to be concentrated on the poorer soils of the State.

The growth of the white population greatly exceeded that of the negro. However, the negro population of New Orleans and other urban areas increased more rapidly than the white.

One of the most significant changes in the State's population was the rapid increase in the number of urban residents between 1890 and 1930. Outside of New Orleans, the number of urban centers increased from 9 to 47, the number of places with populations between 10,000 and 100,000 from 2 to 7, and the number of parishes containing urban centers from 10 to 36. In this period the urban population increased from 283,845 to 833,532, an increase in the percentage of population in urban centers from 25.4 to 39.7 percent. Meantime, the growth of population in the rural areas surrounding the urban centers has far outstripped the increase in the more remote regions.

Upper Freehold Township: A survey of the life, resources and government of a New Jersey rural township, with a program for improvement (*Trenton: N. J. Dept. Agr., 1935, pp. 85, pls. 8, figs. 5*).—This report was prepared by the Bureau of Agricultural Economics, U. S. D. A., the New Jersey Department of Agriculture, the Monmouth County Agricultural Extension Service, and the Upper Freehold Better Township Association. Included are papers on the government of, school finances in, and some economic and social conditions reported by farm families in Upper Freehold Township, by T. B. Manny; the history of the township, by W. R. Hendrickson; agriculture of the township, by E. Douglass; electrification in the township, by L. G. Wygant; the roads of the township, by W. R. Meirs; the schools of the township, by E. S. Bailey; and organizations of the township, by F. Johnson.

References on the mountaineers of the Southern Appalachians, E. E. Edwards (*U. S. Dept. Agr., Library, Bibliog. Contrib. 28 (1935), pp. V+148*).—This bibliography is classified as general articles and books, occupations, social conditions, and folklore and folk songs.

The relation of the Agricultural Adjustment Program to rural relief needs in North Carolina.—Preliminary report, C. H. Hamilton (*Raleigh: N. C. Emergency Relief Admin., 1935, pp. [1]+9, fig. 1*).—This report is a brief and partial summary of the data collected and analyzed in a study of the relation of the Agricultural Adjustment Program to rural relief needs, conducted cooperatively by the Federal Emergency Relief Administration, the North Carolina Emergency Relief Administration, and the North Carolina Experiment Station.

Some problems of rural relief in Tennessee.—A preliminary report, C. E. Allred, M. T. Matthews, and B. H. Luebke (*[Nashville]: Tenn. Emergency Relief Admin., 1935, Rpt. 1, pp. [2]+17, figs. 5*).—This report presents the results of a survey of rural relief in Tennessee made in cooperation with the Federal Emergency Relief Administration, the Tennessee Emergency Relief Administration, and the Tennessee Experiment Station.

Rural relief and rehabilitation possibilities in Wayne County, Tennessee, C. E. Allred, B. H. Luebke, et al. (*[Nashville]: Tenn. Emergency Relief Admin., 1935, Rpt. 2, pp. III+31, figs. 16*).—The purpose of this survey, which was conducted cooperatively by the Federal Emergency Relief Administration, the Tennessee Emergency Relief Administration, and the Tennessee Experiment Station, was to secure information as to the extent to which certain economic and social factors were related to the reasons for the opening of relief cases, the length of time clients were kept on relief, the kind and amount of relief, the reasons for closing, the possibilities for rehabilitation, and related problems.

Resettlement and rehabilitation in the Crandon Land Purchase Area.—Preliminary report, E. L. Kirkpatrick and R. M. Thomas (*[Madison]: Wis. Emergency Relief Admin., 1935, pp. [3]+39+[6]*).—This report presents the results of a survey conducted cooperatively by the Federal Emergency Relief Administration, the Wisconsin Emergency Relief Administration, and the Wisconsin Experiment Station of resettlement and rehabilitation in the Crandon Land Purchase Area. Of the 600 families studied, 44 lived in Florence, 233 in

Vilas, and 323 in Forest Counties. The results indicate that a satisfactory program for the area necessarily will be twofold. It must be concerned (1) with the removal and resettlement of families from isolated submarginal farms in the national and State forests and in the restricted districts under county zoning ordinances, and (2) with the concentration of families in the unrestricted areas and rehabilitation of the resulting communities along such lines as are suggested by the natural resources of the locality.

Survey of relief with reference to rural rehabilitation, E. L. Kirkpatrick and W. Ferguson (*Madison: Wis. Emergency Relief Admin., 1935, pp. [1]+67*).—This report summarizes the results of a study conducted cooperatively by the rural division of the Wisconsin Emergency Relief Administration, the department of rural sociology of the Wisconsin Experiment Station, and the division of research, statistics, and finance of the Federal Emergency Relief Administration

FOODS—HUMAN NUTRITION

Foods and nutrition [studies by the Bureau of Home Economics] (*U. S. Dept. Agr., Bur. Home Econ. Rpt., 1935, pp. 2–6*).—This annual report (E. S. R., 72, p. 560) contains data on the vitamin A content of tomatoes of different colors, the vitamin A content of the leaves and stems of escarole, and the vitamin A, D, and G content of canned salmon of different species; the cooking qualities and composition of eggs from hens on different rations and at different periods of the laying season, the cooking qualities and palatability of pork from hogs fed different rations and lamb and mutton cured and stored for varying lengths of time, methods of removing excess sugar from potatoes following storage at low temperatures, the palatability of different varieties of soybeans and the culinary uses of soybean milk, the keeping and cooking qualities of different edible fats after varying periods of storage, methods of canning meats, the jelly-making qualities of some of the more common fruits, and the pectin content of fruits of *Dillenia indica*, an ornamental tree grown in Puerto Rico.

Food and drug law enforcement (*U. S. Dept. Agr., Sec. Agr. Rpt., 1935, pp. 99–104*).—The function and activities of the Food and Drug Administration are discussed briefly, as are also the byproducts of the research conducted in connection with enforcement of the law, vitamin studies, and investigations in bacteriology.

[The Food and Drugs Act], W. G. Campbell (*U. S. Dept. Agr., Food and Drug Admin. Rpt., 1935, pp. 1–21*).—This annual report on the enforcement of the Federal Food and Drugs Act (E. S. R., 72, p. 560) contains summaries of the food adulterations discovered involving public health, filth and decomposition, and cheats, including 338 seizures of fresh fruits and raw vegetables for spray residues in excess of tolerance (299 of which were apples), and investigations of 73 alleged food poisoning outbreaks, including 7 of botulism, 6 of which were caused by underprocessed home canned foods and 1 by imported canned but unsterilized fish products. Data on new analytical methods which have been developed for the detection and proof of various types of adulteration are also noted.

Foods and drugs, E. R. Tobey (*Maine Sta. Off. Insp. 155 (1935), pp. 20*).—This annual report on the results of the chemical examination of food and drug samples collected by the division of inspection of the State department of agriculture (E. S. R., 72, p. 414) contains tabulated data on analyses of samples of hamburg steak for sodium sulfite, ice cream for fat, maple sugars and sirups for water, sucrose, and lead number, molasses for sucrose and reducing sugars, olive oil for adulteration with cottonseed oil, and vinegar for acidity, solids, and ash.

Bacteria on fresh fruit, M. M. Johnston and M. J. Kaake (*Amer. Jour. Pub. Health, 25 (1935), No. 8, pp. 945–947*).—A study of the bacteria on the skins of fresh fruit (apples, pears, plums, peaches, crab apples, grapes, and tomatoes) purchased from open indoor and outdoor stands in Toronto showed, in addition to staphylococci, proteolytic, and alcaligenes bacilli, 1 strain of *Bacillus dispar* (held to be the cause of dysentery in man) and 3 of nonpathogenic *B. alkalescens*. One strain of *B. coli communior*, 1 of *B. oxytocus perniciosus*, 12 of *B. coli communis*, and 39 of *B. aerogenes* were isolated. Possible fecal contamination is suggested, but no widely accepted pathogens of the colon typhoid dysentery group held responsible for severe summer diarrheas in infants and children were obtained.

Laboratory tests to determine the viability of bacteria transferred to fruits by flies or human hands were carried out by spraying tomatoes and apples with saline suspensions of *B. dysenteriae*, allowing them to stand at room temperature and taking cultures at intervals. The organism persisted on the surface of tomatoes for at least 48 hr. and in the tissues (fissure) for 10 days. It was obtained for 6 but not for 8 days from the skin of the apple.

The technique of determining moisture vapor transmission through papers and boards, D. K. Tressler and C. F. Evers (*Paper Trade Jour., 101 (1935), No. 10, pp. 33–35, fig. 1; also in U. S. Egg and Poultry Mag., 41 (1935), No. 10, pp. 16–19, 56, 57, fig. 1*).—In this paper from the New York State Experiment Station, the authors describe a technic for estimating the rate of transmission of moisture vapor through papers and boards used in the protection of frozen foods during cold storage.

Respiration apparatus for small animals [trans. title], S. Bélák and A. Illényi (*Biochem. Ztschr., 281 (1935), No. 1–3, pp. 27–29, fig. 1*).—A simple closed system respiration apparatus for small animals is described and illustrated. The apparatus consists of a desiccator supported in a water bath and connected through its rubber stopper with a water manometer, a thermometer, an inlet tube for air, and a tube connected with a burette containing barium hydroxide solution. The consumption of oxygen by the animal, which is confined in a small wire cage raised above the bottom of the desiccator, results in a negative pressure which is equalized by admitting barium hydroxide from the burette. The amount of the liquid added measures the oxygen consumption, and the carbon dioxide evolved is determined by back titration of the barium hydroxide.

The influence of external factors on insensible perspiration [trans. title], A. van Harreveld, B. W. Grutterink, and A. K. M. Noyons (*Biochem. Ztschr., 281 (1935), No. 1–3, pp. 1–26, figs. 13*).—This paper contains a review of the literature on the subject, a description of the apparatus and methods employed by the authors for this determination, and the report of an investigation of the influence of atmospheric humidity and temperature and of clothing on the determination.

Contrary to the conclusions in some of the earlier literature, the results of the present investigation indicate that insensible perspiration is affected only very slightly by the external factors studied. Differences in relative humidity of ±35 percent had only a very slight effect on insensible perspiration if the subject was in equilibrium with his surroundings. In very short tests on subjects suddenly exposed to a different humidity the insensible perspiration was greater in a dry than in a moist atmosphere. Under very special circumstances involving sweating, values were obtained suggesting that in moist air more liquid was given off than in dry. It is thought that the reports in the literature showing definite effects of change in humidity may be attributed to lack of adjustment to the environment or sweating.

In a temperature range of from 20° to 28.5° C. the insensible perspiration of a subject in a bathing suit was affected to only a slight degree by differences in temperature. After adjustment to the environment, differences in the weight of clothing had only a slight effect.

The variability of the insensible perspiration in the same subject under conditions as nearly identical as possible was very great, and the variability was still greater in different subjects. Variations of 20 percent from the straight line curve of ratio of insensible perspiration to metabolism were not uncommon. It is because of this variability rather than possible effects of humidity and temperature that the use of insensible perspiration as a measure of metabolism is considered impossible.

Basal metabolism and urinary nitrogen excretion of oriental women, A. H. Turner and F. G. Benedict (*Amer. Jour. Physiol., 113 (1935), No. 2, pp. 291–295*).—This investigation was undertaken to determine whether or not the low basal metabolism of orientals is associated with a low protein metabolism as would be shown by low urinary nitrogen excretion. The subjects were a Korean, a Japanese, a South Indian, and 2 Chinese women who had been living for from 1 to 3 yr. in the United States in an American college environment and consuming an American diet. Five American students in the same college served as controls. In addition, basal metabolism measurements unaccompanied by urine studies were made on 6 other oriental women.

The basal metabolism of the oriental subjects averaged 12 percent below the Harris-Benedict standards and was lower than that of the college girls serving as controls. The total urinary nitrogen excreted daily averaged 7.5 g for the oriental and 8.3 g for the American subjects, and the excretion per kilogram of body weight 167 and 146 mg, respectively. These findings indicate that the protein metabolism of these particular orientals was not markedly different from that of their American college mates, and suggest that the low basal metabolism of foreign-born orientals under an American environment cannot be ascribed to a low protein metabolism.

Studies on the influence of some natural fats and their components on animal tissue structures.—II, The influence on some organic structures of different components of cod liver oil, E. Agduhr (*Upsala Läkarefor. Förhandl., n. ser., 40 (1935), No. 3–4, pp. 183–387*).—A detailed report is given of an extensive investigation of the toxic effects of isolated constituents of cod-liver oil as tested on mice. Originally the materials were fed in quantities corresponding to those occurring in a dose of cod-liver oil of 5 cc per kilogram of body weight per day, but the experiments were later extended to other doses. As a substitute for components of cod-liver oil which have not been isolated, carotene was used for vitamin A, pure crystallized vitamin D (Windaus) for the vitamin D component, and isoamylamine and choline hydrochloride for the nitrogenous constituents. For iodine, sesame oil containing 10 percent of iodine was used. Saturated and unsaturated fatty acids and unsaponifiable material prepared from cod-liver oil by G. Blix were also tested, as well as choline, squalene, and certain alcohols of high molecular weight.

Complete and incomplete basal diets were used, the experiments starting when the mice were about 30 days old and continuing for from 6 to 10 mo. The oils were administered by drops, generally in such concentration in a neutral oil that 1 drop sufficed for the daily dose. At the end of the experimental period the animals were killed and the liver, heart, kidneys, and adrenals examined for organic changes.

The saponifiable fractions of the oil (fatty acids) were toxic. Animals receiving saturated fatty acids in the proportions in which they occur in cod-liver oil showed the most pronounced lesions in the kidneys and heart, while those receiving unsaturated fatty acids had almost as pronounced lesions in all of the organs examined. The unsaponifiable fraction proved less injurious than the saponifiable except for heart lesions, which were as a rule more severe. Other substances showing toxic effects were cholesterol, squalene in large doses, and batyl and octadecyl alcohols. Carotenoids and pure vitamin D had no toxic effect, but ergosterol and to a much greater extent irradiated ergosterol had a toxic effect, especially on the liver, kidneys, and adrenals. Iodine had so marked an effect both on the death rate and organic lesions as to suggest the probability that it accounts for part of the alleged toxicity of cod-liver oil.

The report contains a chapter by G. Blix and B. Vahlquist (pp. 190–196) on the chemistry of cod-liver oil, the method followed in separating the fatty acids, and the calcium content of the bodies and tails of mice on the control diets and the various experimental diets. In most of the experiments, including those with irradiated ergosterol, the quantity of calcium per centimeter length of body was greater in the experimental than in the control animals, while that of the tails showed no increase. This is thought to indicate a deposition of calcium in the soft parts of the body rather than in the bony structure.

Influence of calcium on carbohydrate metabolism, T. Harada (*Bul. Chem. Soc. Japan, 10 (1935), No. 10, pp. 494–503*).—The effect of calcium lactate alone or with adrenalin on glucose tolerance in rabbits was studied, with the conclusion that the calcium lactate "prevented considerably the elevation of the sugar contents in both the blood and urine which would occur when glucose alone or glucose-adrenalin without calcium was administered. However, the calcium had little influence on the activity of adrenalin on the blood sugar. . . . Why calcium assists the combustion of the carbohydrate in the body is not clear. It is presumed that the disease of diabetes is probably attended by an imperfect calcium metabolism, thereby the combustion of the carbohydrate being disturbed either directly or indirectly. In other words, the production or the activity of insulin will probably depend upon the calcium content in the blood."

Calcium availability in foods containing oxalates, E. F. Kohman and N. H. Sanborn (*Indus. and Engin. Chem., 27 (1935), No. 6, p. 732*).—In this preliminary note attention is called to the fact that data are lacking on the availability of calcium in the form of calcium oxalate or as affected by oxalates in excess of calcium in certain foods. Preliminary feeding experiments on young rats on diets containing calcium oxalate and soluble oxalates in varying proportions indicate that the availability of calcium in calcium oxalate is of a low order, and that if soluble oxalates are present at the same time otherwise available calcium is rendered unavailable.

The effects of magnesium deficiency on the teeth and their supporting structures in rats, H. Klein, E. R. Orent, and E. V. McCollum (*Amer. Jour. Physiol., 112 (1935), No. 2, pp. 256–262, figs. 6*).—This continuation of the authors' studies on the effect of magnesium deficiency in nutrition (E. S. R., 72, p. 876) deals with the histological examination of the mouths of 24 rats kept on the low magnesium diet used in the earlier studies from weaning until death or sacrifice at various ages. Zenker fixation, eosin staining, and hematoxylin were used.

The paradontium of the experimental animals showed decreased cell content and increased amounts of a pink-staining intercellular substance. After 17 days of feeding, a deep blue-staining amorphous material was observed in the bone lining the paradontium. After 3 months' feeding, sections of the jaws showed absence of bone around the molar and incisor teeth and its substitution by large pink-staining masses of tissue containing many spindle-shaped cells. The tooth structures themselves showed marked change. The dentine of the molars contained many striations suggestive of an intermittent disturbance in calcification. The portion of the incisors lying within the jaws showed marked changes, particularly in the pulp, which contained a large amount of a deep blue-staining substance of dense and amorphous structure continuous with a layer of well-formed dentine.

These changes are thought to indicate that magnesium is essential for the proper formation of the teeth and their supporting structures in the rat. The possible mechanism of the effects of magnesium deficiency is discussed, with the conclusion that conditions are favorable for precipitation of calcium salts during early growth, while longer feeding of the deficient diet results in excessive loss of calcium and phosphorus. The excessive paradontal proliferation at this point is thought to be an attempt by the connective tissues to compensate for decreased density of the bones.

Aluminum in food, G. W. Monier-Williams (*[Gt. Brit.] Min. Health, Rpts. Pub. Health and Med. Subjs. No. 78 (1935), pp. 34, pl. 1*).—In the introduction to this report the statement is made that the use of alum baking powders is not countenanced in England, and that aluminum cooking vessels have been criticized so persistently that many people have given up their use. Available information is summarized and discussed on the occurrence of aluminum in nature, methods for its determination, the action of food on aluminum vessels, and the behavior of aluminum in the body. The general conclusions drawn are as follows:

"Much of the experimental work which has been carried out to ascertain whether aluminum in food is harmful or not is conflicting and inconclusive. On the general question of the possible effect of very small amounts of metallic salts in the blood and tissues of the body, judgment must be suspended until more definite knowledge is obtained. Aluminum salts, in doses which are not unreasonably high, have been shown to be not without action on digestive processes. It is a safe rule to exclude from food as far as possible anything which may reasonably come under suspicion of causing harm, and on this account it is undesirable to admit aluminum in the relatively large amounts in which it may be employed as a constituent of baking powders or self-rising flour.

"There is, however, no convincing evidence that aluminum in the amounts in which it is likely to be consumed as a result of using aluminum utensils has a harmful effect upon the ordinary consumer. It is possible that there may be individuals who are susceptible to even such small doses of aluminum as may be derived from aluminum utensils, but evidence of this is inconclusive."

The report includes the description of a method of determining aluminum in foods by precipitation with 8-hydroxyquinoline and an extensive list of literature references.

[Vitamin studies of the Bureau of Chemistry and Soils] (*U. S. Dept. Agr., Bur. Chem. and Soils Rpt., 1935, pp. 4, 25, 26*).—This progress report (E. S. R., 72, p. 564) summarizes studies on the suitability of cottonseed oil and various byproducts as diluents and carriers of carotene and on the relative potency of α-, β-, and γ-carotene and cryptoxanthin as precursors of vitamin A.

The role of vitamin A in nutrition, M. B. Richards (*Brit. Med. Jour., No. 3863 (1935), pp. 99–102*).—The investigation noted previously from its biochemical aspects (E. S. R., 73, pp. 721, 724) is here discussed from a clinical viewpoint, with emphasis upon the possible bearing of the findings on questions connected with human nutrition.

Pathological conditions arising in young and adult rats on vitamin A-free diets are discussed with regard to the time and order of appearance, nature, and persistence. Of 37 young animals killed after 3 or 4 weeks on the deficient diet, 75 percent showed macroscopic evidence of disease on autopsy, although marked changes in weight did not ordinarily occur until much later. The earliest macroscopic signs of the disease were in the epithelial lining of the digestive tract. "In rats killed before reaching a moribund state from lack of vitamin A, inflammation of the duodenum, of the small intestine, and of the cecum is frequent, and the glandular portion of the stomach shows pittings, hemorrhagic points, and even ulceration."

In young animals kept from weaning until death on a vitamin A-free diet, gastrointestinal lesions were still more pronounced. In addition cases of tongue abscess, lung infection, and pronounced kidney disease occurred with considerable frequency.

In 16 older animals kept on a normal diet until the age of from 5½ to 6 mo. and then transferred to a vitamin A-free diet, the survival period ranged from 158 to 320 days. On autopsy no tongue abscesses were found, and the incidence of stomach and intestinal troubles was still more marked and that of lung infection much higher than in young animals.

A number of typical examples are given showing that failure to grow satisfactorily following a curative treatment with vitamin A is associated with persistence in the pathological condition. This pathological condition as a result of vitamin A deficiency may persist after several months on the normal diet.

In discussing the relation of the findings to human nutrition, reference is made to several reports in the literature indicating a parallelism between the human species and the rat in the requirement for vitamin A. The most serious danger from deficiency in vitamin A in infancy and early childhood is thought to lie in the possibility of irreparable damage to the tissues. "Thus it may well be, as pointed out in the Medical Research Council's report with regard to vitamins in general [E. S. R., 68, p. 564], that the damage caused by insufficiency of vitamin A in early youth cannot afterward be made good by an adequate supply of the vitamin, and that much chronic ill-health in later life may have its origin in this early deficiency. The high incidence of gastric and intestinal trouble in adult rats deprived of vitamin A is another suggestive fact not to be overlooked in considering the frequency of the occurrence of gastric and duodenal ulcers in adult human beings."

Growth of the tails of young rats on adequate and inadequate vitamin A [trans. title], M. MALMBERG (*Biochem. Ztschr., 281 (1935), No. 1-3, pp. 215-218, figs. 6*).—Exception is taken to the conclusion of Orr and Richards (E. S. R., 73, p. 724) that in young rats on a vitamin A-deficient diet growth in tail length (as an index of skeletal growth) continues after the animals have begun to lose weight. Corresponding curves of body weight and increase in tail length are given for eight rats on a vitamin A-free diet and the same number on a diet supplemented with 20γ of carotene daily. In both cases the curves ran more or less parallel.

Plural nature of vitamin B, A. G. HOGAN and L. R. RICHARDSON (*Nature [London], 136 (1935), No. 3431, p. 186*).—Further light on the plural nature of vitamin B is afforded by this brief note from the Missouri Experiment Station, in which attention is called to observations that the dermatitis in rats resulting from a diet in which the B vitamins were supplied by vitamin B carriers previously subjected to intense irradiation and the denuded condition caused by a diet in which the sole source of the B vitamins was tikitiki, the alcoholic extract of rice polishings, are curable by unlike treatment.

"The denuded condition is healed by either hepatoflavine or lactoflavine, and the rats grow rapidly on the combination of tikitiki and flavine. Wheat germ oil is ineffective. The dermatitis is not relieved by flavines, but is healed by wheat germ oil. Growth will not be sustained unless the irradiated supplement is fortified both by wheat germ oil and flavines. Ultraviolet irradiation destroys two vitamins. One is flavine, the other is the unidentified factor required to prevent dermatitis."

Studies on the vitamin B complex: Further indications for the presence of a third factor, R. J. Block and R. B. Hubbell (*Yale Jour. Biol. and Med., 8 (1935), No. 2, pp. 169–174, fig. 1*).—In continuation of earlier studies on the components of the vitamin B complex, two preparations from rice polishings were used as the source of vitamin B_1. The first was obtained by adsorption of an extract of rice polishings on Lloyd's reagent at pH 4.5 and elution with sodium hydroxide at pH 13 (E. S. R., 67, p. 503) and the second by elution of the adsorbate on Lloyd's reagent with alcoholic hydrochloric acid (E. S. R., 72, p. 443). As sources of vitamin B_2, a concentrate from fresh liver, the commercial Lilly liver concentrate No. 343, and a purified vitamin B_2 concentrate (E. S. R., 73, p. 410) were used. Albino rats of approximately 50 g body weight at 21 days were fed a highly purified basal diet supplemented by 20 mg per rat per week of a cod-liver oil concentrate rich in vitamins A and D and 2.5 international units per day of one or the other of the two vitamin B_1 concentrates. After a depletion period of 15 days, the vitamin B_2 preparations were added for a period of 30 days during which the gains in weight were recorded.

With daily supplements of 2.5 international units of the alkali-extracted vitamin B_1 concentrate and 100 mg of liver concentrate No. 343, the average daily gain in weight during the 30-day period was 4.6 g. When for the liver extract there was substituted a purified vitamin B_2 preparation from fresh liver, the growth rate fell to 2.7 g per day. A further decrease in the growth rate to 1.2 g per day resulted when the acid-extracted vitamin B_1 concentrate was substituted for the alkali-extracted concentrate, with resumption of growth at a more rapid rate on replacing the acid extract by the alkali. Similar results were obtained with the two vitamin B_1 concentrates when a vitamin B_2 concentrate prepared from protein-free milk was used.

Although the evidence was thought to be insufficient to show whether this progressive slowing of the growth rate with increasing purification of the diet was due solely to suboptimal proportions of the factors studied or to the need of other factors removed in purification, the fact that increasing the amounts of the acid-extracted vitamin B_1 preparation and of the vitamin B_2 concentrates did not improve the growth rate is thought to point to the improbability of deficiency of known factors as the cause of the lower growth rate and to indicate that "in addition to vitamin B_1 and vitamin B_2 another factor (or factors) in the vitamin B complex is needed for the growth of the albino rat. This 'third factor' is present in rice polishings. It is adsorbed on Lloyd's reagent and is eluted by dilute sodium hydroxide, but not by alcoholic hydrochloric acid."

Vitamin C in lower organisms, G. Bourne and R. Allen (*Nature [London], 136 (1935), No. 3431, pp. 185, 186*).—Using the acetic acid-silver nitrate reagent for vitamin C, the authors obtained positive tests in the form of black granules in certain protozoa, bacteria, molds, lichens, and algae. It is suggested that "vitamin C is essential for the existence of living protoplasm, probably as an integral part of an oxidation reduction system. Its high concentration within certain organs may indicate a nonspecific catalysis of the manufacture of the hormones of those organs."

Occurrence of ascorbic acid in the crystalline lens and aqueous humor [trans. title], V. Demole and H. K. Müller (*Biochem. Ztschr., 281 (1935), No. 1-3, pp. 80-85, figs. 2*).—To determine the presence and concentration of ascorbic acid in the crystalline lens and aqueous humor of the eye, these materials obtained from fresh beef eyes from the slaughterhouse were tested by subcutaneous injection in scorbutic guinea pigs. The aqueous humor was administered in the natural state and the lens in the form of a trichloroacetic acid filtrate neutralized with sodium carbonate just before injection.

Both materials proved to be rich in vitamin C as determined by gains in weight and cure of scorbutic symptoms. Three cc of the aqueous humor was equivalent in antiscorbutic potency to 0.5 mg of ascorbic acid, this value agreeing closely with the indophenol-reducing capacity of the material. Although lack of material prevented the determination of the minimum protective dose of the lens, an amount equivalent in reducing power to 0.9 mg ascorbic acid was definitely curative. It is estimated that at least 50 percent of the indophenol reducing material in the lens is ascorbic acid.

Blood pressure change during the course of experimental scurvy in guinea pigs [trans. title], N. Söderström (*Upsala Läkareför. Förhandl., n. ser., 40 (1935), No. 3-4, pp. 393-401, figs. 5*).—An apparatus for determining the diastolic and systolic blood pressure in guinea pigs (ear lobe) is described, and data are reported on its use on normal and scorbutic guinea pigs and on the latter during treatment for scurvy. In the healthy animals there was a clear differentiation between the diastolic and systolic pressure, but in the lowered pressure of vitamin C deficiency the diastolic pressure could not be detected.

Tests carried out on 200 persons with Göthlin's method for determining the strength of the skin capillaries and statistical treatment of the results, H. Geschwind and N. Rundqvist (*Upsala Läkareför. Förhandl., n. ser., 40 (1935), No. 3-4, pp. 403-420*).—This report is presented in three parts.

Part 1, by N. Rundqvist, contains tabulated capillary resistance data obtained by the Göthlin method (E. S. R., 72, p. 422) on 64 medical students (chiefly male) at Uppsala University, 118 healthy elementary school children (60 girls and 58 boys), and 18 children who had just returned to school after absences for periods up to 7 days owing to "chills." The tests were made first on one arm at 35-mm pressure and then on the other at 50-mm pressure. After a given interval, from 1⅔ to 6⅙ hr. for the medical students and from 20 to 24 hr. for the children, the arms previously tested at 35 mm were tested at 50 mm.

In part 2, by H. Geschwind, the statistical treatment of the data is reported and discussed with particular reference to the individual variations between the results on the left and right arms, to the advisability of shifting slightly the limits of the various vitamin C standards as set up by Göthlin, and to the possibility of doing away with the 35-mm test altogether.

Part 3, by N. Rundqvist, gives the calculations of the mean number of petechiae found in tests with a pressure of 50 mm calculated for each arm, first when the 35-mm test had preceded the 50-mm and second when only the 50-mm test was used. Final recommendations are given in a footnote in the suggestion from Göthlin that "when the capillary test is carried out for one individual determination the test should be carried out simultaneously on both arms and the estimation of the vitamin C standard based on the mean number of petechiae met with on the left and right arms."

The influence of increased magnification on the results of the capillary resistance test [trans. title], L. Billing (*Upsala Läkareför. Förhandl., n. ser., 40 (1935), No. 3-4, pp. 389-392*).—Data are given showing a considerable increase in the number of petechiae observed in the Göthlin capillary resistance test when a so-called "postage stamp" magnifying glass was used in place of the customary glass with lower magnification. Attention is called to the necessity for uniform magnification for comparable results.

Treatment of infantile scurvy with cevitamic acid, E. Goettsch (*Amer. Jour. Diseases Children, 49 (1935), No. 6, pp. 1441–1448*).—Clinical and laboratory reports are given for 8 cases of infantile scurvy, in 5 of which cevitamic (ascorbic) acid, and in the other 3 large doses of orange juice, constituted the antiscorbutic treatment. The subjects included two sets of twins, one of whom in each pair received the ascorbic acid and the other the orange juice treatment. Serial roentgenograms were used to observe healing of the scorbutic lesions, and studies of the urinary excretion were carried out on 2 of the infants. The cevitamic acid was given in different dosages and for different lengths of time. In all cases it was administered first by intravenous injection, followed in all but one case by later treatment orally. In 3 cases, 400 mg was administered intravenously with from 6 to 9 days' interval before further treatment, which consisted in 1 case of 30 and the other 2 of 100 mg daily by mouth.

As judged by the subjective symptoms, cevitamic acid treatment was at least as effective as orange juice. Healing as judged by calcification of subperiosteal hematoma occurred more rapidly. In 3 of the infants pain was relieved more quickly than in the orange juice controls, but in no case was it relieved immediately. The cevitamic acid was well tolerated even in the largest dosage administered. With both the cevitamic acid and the orange juice a single massive dose was found to be as effective as the same total dose given in small daily portions over a period of several days.

One of the 2 subjects on whom studies of urinary cevitamic acid excretion were carried out continued to excrete the acid in relatively high concentration for 6 days after ingestion was stopped, although the total quantity excreted during this time was only a small fraction of the amount ingested. The other also excreted cevitamic acid in fairly high concentration for 2 days following intravenous administration. The tests were not carried on beyond this time. "It is apparent that the excretion of cevitamic acid by these 2 scorbutic infants did not parallel that noted in the case of normal children or adults."

The occurrence of vitamin D in herrings [trans. title], **G. Blix, H. Rydin, and G. Englund** (*Upsala Läkareför. Förhandl., n. ser., 40 (1934), No. 1–2, pp. 175–182; Eng. abs., p. 181*).—Three samples of herring oil obtained from herring caught off the north coast of Uppland in February, June, and September, respectively, all contained about 200 international units of vitamin D per gram, an antirachitic potency of the same order as that of good grade cod-liver oil.

Nutrition and infection, S. W. Clausen (*Jour. Amer. Med. Assoc., 104 (1935), No. 10, pp. 793–798, fig. 1*).—After a preliminary discussion of certain constitutional factors which must be taken into account in considering susceptibility to infection, the more significant observations in the literature bearing on the loss of resistance to infection due to deficiency of food elements are summarized, and the possible mechanism of the loss of resistance is discussed.

Admitting that clinical observations indicate that loss of resistance to infection occurs in man with outspoken deficiency of vitamin A and probably vitamin C, the author states his belief that "there exists no evidence in experiments with animals or in clinical observation that the addition of any of the vitamins to the diet will increase the resistance to infection of the host when the host has already been consuming a normal diet. There is also no evidence that a good diet will decrease the number of infections during the first 6 mo. of life. There is some evidence that an adequate diet in the early months of life may decrease the severity of infections during the latter part of the first year and during the second year. There is little reason to believe that the administration of vitamins after the onset of an acute infection will exercise any benefit on resistance. Chronic infections have so far not been adequately observed, with the exception of tuberculosis."

Report on recent researches upon the nature and therapy of pernicious anaemia, E. W. ADAMS (*[Gt. Brit.] Min. Health, Rpts. Pub. Health and Med. Subjs. No. 75 (1934), pp. 22*).—This memorandum to the Ministry of Health, Great Britain, contains a prefatory note by the chief medical officer, G. Newman, in which it is stated that the fall in death rate from pernicious anemia immediately after the introduction of liver treatment in 1927 has not been maintained. In the hope that more lives might be saved by a fuller appreciation of the precautions necessary to secure satisfactory results in the treatment of pernicious anemia, the memorandum has been prepared to review the more important recent research and summarize the present position of knowledge concerning the nature and therapy of pernicious anemia.

Goat's milk anemia, G. O. KOHLER, C. A. ELVEHJEM, and E. B. HART (*Amer. Jour. Physiol., 113 (1935), No. 2, pp. 279–284, figs. 4*).—This contribution from the Wisconsin Experiment Station reports a study of goat's milk anemia following the usual technic of feeding young rats solely on milk until the hemoglobin was reduced to from 2 to 3 g per 100 cc and then testing the effect of various supplements. In the first experiments the rats were fed cow's milk until anemia developed, but in the later work they were given only goat's milk.

The same response was shown to the addition of 0.5 mg iron as $FeCl_3$ and 0.1 mg copper as $CuSO_4$ as in anemia produced by cow's milk, but the growth of the rats on the goat's milk was inferior to that on cow's milk even when the milk was further supplemented with manganese. Growth was no better following further supplementation of the milk with cod-liver oil, yeast, liver, or crystalline vitamin B_1. Normal growth was obtained with the addition of brain tissue.

In later experiments, when the rats were fed milk from the same goats fed on a better grade of alfalfa hay, growth was much better.

These results show that goat's milk anemia is of the same type as cow's milk anemia in being readily cured by iron and copper salts, and that goat's milk varies as does cow's milk with the quality of the ration.

Blood regeneration in severe anemia: Fractions of kidney, spleen, and heart compared with standard liver fractions, F. S. ROBSCHEIT-ROBBINS, G. B. WALDEN, and G. H. WHIPPLE (*Amer. Jour. Physiol., 113 (1935), No. 2, pp. 467–475*).—Earlier tests of various liver fractions for their potency in blood regeneration in dogs after severe bleeding (E. S. R., 61, p. 393) have been repeated with fractions prepared from liver for the treatment of pernicious anemia and secondary anemia and the residue from the original extraction of the glands for these anemia fractions. Similar fractions were also prepared from pig spleen, pig kidney, and beef heart and tested in like manner. The data are given on the net hemoglobin produced in grams per 2-week feeding period on an intake of 300 g of fresh tissue or the fractions derived from 300 g. The data also include the corresponding iron intakes in milligrams and the weight ratios of the fractions to the fresh tissues.

Fresh pig liver gave an average hemoglobin production of 100 g in 2 weeks as compared with 87 for pig spleen, 74 for pig kidney, and 53 g for beef muscle. The potency of the pernicious anemia fractions for hemoglobin production was kidney 47, spleen 36, heart muscle 33, and pig liver 15 g; of the secondary anemia fractions, pig liver 75, pig kidney 43, beef heart 40, and pig spleen 39 g;

and of the residue, pig spleen 65, pig liver 63, beef muscle 58, and pig kidney 35 g. The iron content of the various fractions was highest in the residue and lowest in the pernicious anemia fractions.

"All evidence points to several factors rather than a single factor as responsible for the potent influence of these fractions upon the regeneration of red cells and hemoglobin in experimental anemia due to blood withdrawal."

Hemoglobin regeneration as influenced by diet and other factors, G. H. Whipple (*Jour. Amer. Med. Assoc., 104 (1935), No. 10, pp. 791–793, fig. 1*).—In this Nobel Prize lecture, the author reviews the research conducted in his laboratories from 1908 to the present time on chronic anemia in dogs produced by bleeding, with the following comment in closing:

"It is obvious to any student of anemia that a beginning has been made, but our knowledge of pigment metabolism and hemoglobin regeneration is inadequate in every respect. This is a stimulating outlook for the numerous investigators in this field, and much progress in the near future may be confidently expected."

Hemoglobin regeneration in the chronic hemorrhagic anemia of dogs (Whipple).—I, The effect of iron and protein feeding, C. C. Sturgis and G. E. Farrar, Jr. (*Jour. Expt. Med., 62 (1935), No. 4 pp. 457–465 fig. 1*).—This paper reports further investigation of the chronic hemorrhagic anemia in dogs of Whipple et al. as noted above, particularly as concerns the cause of the greater effectiveness of liver than of inorganic iron in hemoglobin regeneration in this type of anemia.

The addition of liver to the standard salmon bread diet during a 2-week period promoted a definitely greater regeneration of hemoglobin than did an amount of iron equivalent to that contained in the liver. As the salmon bread furnished from 1 to 1.5 mg of copper daily, a deficiency of this element was considered unlikely. A diet containing inorganic iron and casein in amounts furnishing the same calories, iron, and protein nitrogen as liver caused no greater response than that obtained by the addition of inorganic iron alone to the standard basal diet. The possibility that the salmon bread produced a deficiency of the amino acids represented in casein was ruled out by the demonstration that dogs on the high protein (casein) Cowgill dog ration showed the same basal hemoglobin regeneration and a similar greater response to liver than to inorganic iron.

Although no conclusions can yet be drawn concerning the nature of the special hemoglobin-regenerating substance or substances in liver, the quantitative nature of the hemoglobin response of dogs to the same substance in different tests led the authors to conclude that "such an animal has, therefore, a hemorrhagic type of anemia with the accuracy and sensitivity necessary for assay purposes comparable to the nutritional anemia type obtained in the young rat by an exclusive milk diet."

Outbreak of food poisoning, probably due to Staphylococcus aureus, A. Corpening and E. P. Foxhall (*Amer. Jour. Pub. Health, 25 (1935), No. 8, pp. 938–940*).—The outbreak described, which involved 12 people but no fatalities, was traced to a cake with custard filling which had been left at room temperature several hours after having been kept in the refrigerator overnight. A similar cake eaten at luncheon on the day it was baked caused no reaction. Of the four types of organisms identified in the cake, *S. aureus* predominated. Filtrates from cultures of this organism proved toxic and from two others isolated from the cake nontoxic to human volunteers.

The source of contamination was not discovered. The kitchen, pantries, and refrigerators were clean, and the cooks and helpers were well and gave no history of having been ill the previous month.

TEXTILES AND CLOTHING

Textiles and clothing [studies by the Bureau of Home Economics] (*U. S. Dept. Agr., Bur. Home Econ. Rpt., 1935, pp. 7-10*).—This annual report (E. S. R., 72, p. 572) includes summaries of physical and chemical analyses of representative turkish towels and household and camp blankets, service studies on blankets of known fibers and construction, and the effect of ironing upon sheeting fabrics of known composition.

A practical laboratory method of making thin cross sections of fibers, J. I. HARDY (*U. S. Dept. Agr. Circ. 378 (1935), pp. 11, figs. 16*).—The use of a device invented by the author and described enables one in a few minutes to cut a cross section of a group of from 100 to 300 fibers thin enough for critical examination of their internal structure. This device provides a means for holding the fibers and pushing them through a slot 0.0085 in. wide. Celluloid solution is applied to the ends of the fibers and allowed to dry. The thin film of celluloid containing the cross section is cut off with a safety razor blade, mounted in Canada balsam, and is ready for microscopic examination.

HOME MANAGEMENT AND EQUIPMENT

Economic studies [by the Bureau of Home Economics] (*U. S. Dept. Agr., Bur. Home Econ. Rpt., 1935, pp. 11-13*).—This report summarizes studies of the consumption habits and needs of American families, particularly those of the Southern Appalachian families (E. S. R., 73, p. 264) and a more extensive study of 228 of the families in Knott County, Ky.

Housing and equipment studies [by the Bureau of Home Economics] (*U. S. Dept. Agr., Bur. Home Econ. Rpt., 1935, pp. 10, 11*).—This progress report includes brief summaries of laboratory tests of the efficiency of surface heating elements and ovens in electric ranges, small separate pieces of electric cooking equipment, and mechanical refrigerators.

MISCELLANEOUS

Report of the Secretary of Agriculture, 1935, H. A. WALLACE (*U. S. Dept. Agr., Sec. Agr. Rpt., 1935, pp. III+120*).—In addition to findings noted elsewhere in this issue or previously (E. S. R., 74, p. 289), data are given on the cost and utility of fertilizer materials, including high-analysis fertilizers; road construction; and international cooperation in weather studies.

Report of the Chief of the Bureau of Plant Industry, 1935, F. D. RICHEY (*U. S. Dept. Agr., Bur. Plant Indus. Rpt., 1935, pp. 40*).—In addition to research data noted elsewhere in this issue, this report contains a classified list of publications by members of the Bureau's staff.

Forty-seventh Annual Report of the Kentucky Experiment Station for the year 1934, II (*Kentucky Sta. Rpt. 1934, pt. 2, pp. [384], figs. 31*).—This contains reprints of Bulletins 346–355 and Circulars 41–43, all of which have been previously noted.

[Forty-seventh and Forty-eighth Annual Reports of the Maryland Station, 1934 and 1935], H. J. PATTERSON (*Maryland Sta. Rpts. 1934, pp. XXXIV+456, pls. 8, figs. 53; 1935, pp. XLII+335, pls. 5, figs. 65*).—In addition to experimental work previously noted or referred to elsewhere in this issue, these reports include, respectively, reprints of Bulletins 351-364 and 365–377.

NOTES

California University and Station.—H. R. Tolley, director of the Giannini Foundation of the university, has been designated acting administrator of the U. S. D. A. Agricultural Adjustment Administration during the extended absence of Administrator Chester C. Davis, who is making a survey of economic conditions and policies of European countries as they affect the demand for American farm products.

Georgia Station.—R. G. Pridmore, assistant agronomist, has resigned to engage in commercial work.

Hawaii Station.—John Castro, plant propagator since 1925, died February 25.

Purdue University and Indiana Station.—The recent death is noted of four members or former members of the staff of long service. These included, on December 22, 1935, William C. Latta, instructor in agriculture and superintendent of the farm from 1882 to 1893, professor of agriculture from 1883 to 1911, agriculturist in the station from 1888 to 1905, and superintendent of State farmers' institutes from 1889 to 1923, at the age of 85 years; on the day previous, Otis S. Roberts, chief inspector in the fertilizer and feeding stuffs control for 25 years, at the age of 73 years; on February 28, 1936, George Spitzer, associated with the institution since 1899 and since 1913 in charge of the chemical research laboratory, at the age of 76 years; and on April 19, Samuel D. Conner, associated with the chemical work since 1899 and research chemist since 1925, at the age of 63 years.

A new 43-acre farm was acquired in 1935 in Knox County to replace a former experimental field which has been returned to the county for reestablishment of an infirmary. Projects under way include erosion control, fertility trials, pasture grass studies, crop variety testing, rotations, and experiments with horticultural crops. The farm contains small storage buildings, a peach orchard, and a 7-acre wood lot.

I. A. Pickard has succeeded L. E. Hampton as superintendent of the Herbert Davis Forestry Farm.

Iowa College and Station.—Dr. R. M. Hughes has resigned as president, becoming president emeritus. He has been succeeded by Dr. Charles E. Friley, vice president of the college and dean of the division of industrial science. George W. Godfrey, assistant to the president in agriculture, has been appointed director of agricultural relations to take over the work carried on by President Hughes as acting director of agriculture.

F. Scott Wilkins, research assistant in farm crops, died March 31, aged 46 years. A native of Pennsylvania and a graduate of the South Dakota College in 1914, he received the M. S. degree from the Iowa College in the following year. Thereafter he had been in charge of forage crops investigations in the station.

Dr. S. C. Whitlock, assistant professor of veterinary anatomy, resigned effective March 15 to accept a position with the Michigan Department of Wild Life Conservation for work on the pathology of wildlife.

Kansas College and Station.—Beginning July 1, the department of agricultural economics is to be merged with that of economics and sociology under the latter title. Dr. W. E. Grimes will be head of the enlarged department and in charge of a section devoted to research and instruction in agricultural economics. Dr. Randall C. Hill will be in charge of a section of sociology.

Dr. Francis S. Schoenleber, framer of the curriculum in veterinary medicine and a leader in the research culminating in the development of vaccines for the prevention of blackleg in cattle, died January 6 at Tampa, Fla., at the age of 75 years. A graduate of the Iowa College in 1885 and associated with several veterinary colleges, he came to Kansas in 1905 to head the department of veterinary medicine, remaining until 1917 when he entered commercial work.

F. J. Zink, associate professor and associate in agricultural engineering, has resigned to engage in commercial work.

Kentucky Station.—D. W. Young resigned as assistant chemist January 31. Recent appointments include John H. Bondurant as assistant in farm management; Dr. H. H. Thornberry as assistant plant pathologist; and John B. Roberts of the Kansas College and Station as assistant in markets.

Louisiana University and Station.—A new building program is to begin in the near future, utilizing the proceeds of a bond issue of $1,500,000. This program will include, besides increased provision for chemical laboratories and general classroom space, an animal industry building and cold storage plant, an agricultural building which will house the department of forestry and the offices of agencies of the U. S. Department of Agriculture located at the university, and a physics and mathematics building. Extensive construction projects for sewers, street widening and paving, and the improvement of the 665 acres of farm land recently purchased for an addition to the university farm, and similar work are also being undertaken as WPA projects.

Dr. Warren E. Hinds, long prominent among economic entomologists and president of the American Association of Economic Entomologists in 1933, died suddenly on January 11 in his sixtieth year. A native of Massachusetts, he was graduated from the Massachusetts College in 1899 and in 1902 was the first recipient of the Ph. D. degree from the same institution. He then received an appointment with the U. S. D. A. Bureau of Entomology, mainly in connection with bollweevil work at Victoria, Tex. Resigning to become head of the department of zoology and entomology of the Alabama Polytechnic Institute and entomologist of the Alabama Station, he served in this capacity until 1924 when he became entomologist in the Louisiana Station and extension service. In addition to his work in this country, he had also studied cotton pests in Cuba and served as an adviser on these insects to the Peruvian Government. He was a prolific writer, contributing over 100 papers dealing especially with thrips, cotton insects, stored-products and truck-crop insects, and sugarcane pests and their control by parasites. According to a tribute to his work in the *Journal of Economic Entomology*, "his philosophy of the science and practice of economic entomology as expressed in his own words was a 'happy field of investigational adventure and of satisfactory, helpful service to our fellowmen.' "

Dr. C. O. Eddy, associate entomologist in the Kentucky Station, has been appointed to succeed Dr. Hinds as head of the department of entomology in the station. Fred D. Cochran has been appointed assistant horticulturist, effective August 1.

Other recent appointments include F. L. Davis as associate soil technologist, Dr. Harold Hoffsommer as associate rural sociologist, Dr. T. C. Ryker as assistant plant pathologist for work on diseases of rice, and Dr. Roy A. Ballinger as associate agricultural economist for research in agricultural marketing.

Massachusetts Station.—Lorian P. Jefferson, associated with the economics work of the college from 1912 to 1920 and from that date to her retirement in 1935 research professor of agricultural economics in the station, died December 30, 1935, at the age of 64 years.

Dr. R. W. Phillips, instructor in animal husbandry and assistant animal husbandman, has been appointed associate animal husbandman in the U. S. D. A. Bureau of Animal Industry, with headquarters at the Beltsville Research Center. Moses E. Snell, technical assistant in agronomy, has resigned effective May 1 and was succeeded by Karol Kucinski. Other appointments include George Graves as assistant research professor in horticulture for special work in connection with problems related to the culture of nursery plants, with headquarters at the Waltham Field Station; Lawrence Southwick as research assistant in pomology; and Joseph L Kelley as technical assistant for cranberry research.

Minnesota University and Station.—The station is joining the U. S. D. A. Bureaus of Dairy Industry and Animal Industry in an evaluation of the Danish Red dairy cattle. A herd of 22 females and 2 males imported and owned by the Department has been established at the Southeast Experiment Station, where their performance records will be studied and where breeding operations will be conducted. The first effort will be in the direction of determining the productive ability of these cattle and the degree to which they transmit both form and efficiency in production. Breeding operations will be conducted from the genetic approach with careful attention to the transmission of such factors as color, high production ability, and other factors contained in the breed.

Dr. H. K. Hayes, chief of the division of agronomy and plant genetics, has been granted a year's sabbatical leave to be spent in China, where he will serve as adviser to the Chinese Government on crop production problems and plant breeding studies. In his advisory capacity he will work directly with Dr. T. H. Shen, head of crop production in the Chinese National Research Bureau, which has recently been granted a large appropriation for crop improvement work. It is hoped to develop a coordinated national program for the breeding of wheat, rice, cotton, Irish potatoes, and sweetpotatoes, and possibly tobacco.

The station fruit breeding farm has developed as commercial varieties a new apple and a new plum. The apple, named Beacon, is an attractive, solid red-colored fruit which should meet the market well, and the tree is very productive, vigorous, and hardy enough to be grown anywhere in Minnesota. The plum, named Ember, is a hybrid resulting from a cross made 23 years ago between Luther Burbank's Shiro and a plum from the South Dakota College. It is medium to large in size, of exceptionally good quality for dessert and cooking purposes, clings to the tree, and keeps well after harvest. It is recommended for central and southern Minnesota, but it is too late in maturing to be grown successfully in northern Minnesota and similar latitudes.

Nebraska University and Station.—The death is noted of Dr. Samuel Avery, chancellor from 1908 to 1927, on January 25 at the age of 71 years, and of Elber Brock Lewis, research agricultural engineer (rural electrification) since 1926, on March 12 at the age of 49 years.

Dr. Avery was a native of Illinois, but graduated from the university in 1892, also receiving the A. M. degree in 1894, as well as the A. B. and LL. D. degrees from Doane College in 1887 and 1909, respectively, the Ph.D. degree from Heidelberg in 1896, and the LL. D. degree from the University of Idaho in 1909. His work was done largely in Nebraska, beginning in 1896 as adjunct professor of chemistry. He served as professor of chemistry and chemist in the Idaho University and Station from 1899 to 1901 and held the rank of major in the Chemical Warfare Service during the World War. Prior to undertaking administrative work, he had carried on much chemical research, and since retirement had served as chancellor emeritus and professor of research in chemistry. He was prominent in both scientific and academic circles and served as president of the Association of American Agricultural Colleges and Experiment Stations in 1920.

New Mexico College and Station.—Dr. A. L. Stark, assistant professor of horticulture and assistant horticulturist, resigned April 1 to return to the Utah College as extension horticulturist.

North Carolina College and Station.—*North Carolina State Agriculturist* notes the appointment of G. Wallace Giles as assistant professor of agricultural engineering and of Dr. Emerson R. Collins, assistant soil technologist in the U. S. D. A. Bureau of Plant Industry, as agronomist in soil fertility in the station, the latter succeeding Dr. H. B. Mann, resigned to engage in commercial work.

South Dakota College and Station.—Recent appointments include Loren E. Donelson as professor of rural journalism and editor, Stanley P. Swenson as assistant professor of agronomy and assistant agronomist, and H. P. Hanson as assistant professor of agricultural economics.

Tennessee University.—Forestry courses are to be offered in general forestry; forest mensuration; seeding, planting, and erosion; dendrology; and silviculture. G. B. Shivery has been appointed farm forestry specialist in the department of horticulture.

C. E. Brehm, assistant director of the extension service, has been appointed director vice Charles A. Keffer, who died December 31, 1935, at the age of 74 years. Director Keffer was a native of Iowa, receiving the degree of master of horticulture from the Iowa College in 1887. He had been associated with the South Dakota, Missouri, and New Mexico Colleges and Stations, mainly in horticulture, and the U. S. D. A. Division of Forestry, coming to Tennessee in 1900 as head of the department of horticulture and forestry and assuming charge of the extension service upon its establishment in 1914.

Vermont University.—Dr. E. O. Herreid, assistant in dairy husbandry in the Minnesota Station, has been appointed assistant professor of dairy manufacturing. H. N. Stapleton has been appointed extension agricultural engineer in connection with the rural electrification program and other engineering problems.

Twelfth Forest Experiment Station.—The series of 12 forest experiment stations authorized under the McSweeney-McNary Forest Research Act has now been completed by the establishment of a new forest and range experiment station for the Rocky Mountain region, with headquarters at the Colorado College in Fort Collins. Dr. Richard E. McArdle, dean of the Forest School of the University of Idaho, has been appointed director, with Dr. R. F. Taylor chief of the division of forest management and L. F. Palmer chief of the division of range management.

Seventh International Genetics Congress.—An invitation from the Academy of Sciences of the U. S. S. R. to hold the next Congress in Moskva and Leningrad in 1937 has been accepted by the Permanent International Committee. The precise date of the Congress will be determined later.

Association of Land-Grant Colleges and Universities.—The fiftieth annual convention will be held at Houston, Tex., November 16–18, 1936.

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PROGRESS OF AGRICULTURAL RESEARCH IN GREAT BRITAIN

The recent appearance of a comprehensive volume entitled Reports on the Work of Agricultural Research Institutes and on Certain Other Agricultural Investigations in the United Kingdom, 1933–1934, brings out rather prominently the large amount of agricultural research which, in spite of some curtailments for reasons of economy, is under way in Great Britain. The volume itself corresponds in a general way to the annual report on the work and expenditures of the agricultural experiment stations in the United States, but among the differences is the presentation of the results of the year for each institution, without attempt to summarize the work as a whole. A clear-cut picture is thereby afforded of the organization and development of the individual projects and of some of the outstanding findings which have been made.

The agricultural research system in Great Britain is unique, but it at least approaches that in the United States in its complexity of organization. Administrative and regulatory functions and also some research are conducted by the Ministry of Agriculture and Fisheries for England and Wales, the Department of Agriculture for Scotland, and the Ministry of Agriculture for Northern Ireland. Funds for research, however, are mainly derived from grants to the Development Commission, which makes allotments to the governmental departments but even more extensively to privately organized universities, colleges, research institutions, advisory centers, societies, and other groups and organizations.

Most important among the research agencies are the research institutes, of which typical members are the Rothamsted Experimental Station and the Macauley Institute for Soil Research; the National Institute of Agricultural Botany at Cambridge and the Welsh Plant Breeding Station; the Institute of Agricultural Parasitology of the London School of Hygiene and Tropical Medicine; the Research Institute in Animal Pathology of the Royal Veterinary College; the Animal Nutrition Research Institute at Cambridge and the Rowett

Research Institute in Aberdeen for nutrition; the Institute of Animal Genetics at Edinburgh University; the National Institute for Research in Dairying at Reading and the Hannah Dairy Research Institute at Ayr; and the Agricultural Economics and Agricultural Engineering Research Institutes, both at Oxford University. In all 44 research institutes (approximately the number of State experiment stations in this country) are listed and discussed. Some of these are narrowly specialized, but many carry on a number of lines of work.

The survey opens with an account of the institutions giving major attention to soils, plant nutrition, and plant physiology. Conspicuous among these is Rothamsted, which reports on the inoculation of alfalfa and clover seed; the manuring of sugar beets; the value of basic slag and poultry manure; the role of minor elements, such as manganese and molybdenum; the improvement of the quality of malting barley, wheat, potatoes, and green fodder crops; soil cultivation with a view to reducing the number of operations; the making of artificial manures; the varying action of mosaic virus strains on tomatoes; beekeeping; and the chemical evaluation of samples of pyrethrum. At the Macauley Institute examination of the soil types found in Scotland was continued, as well as studies of the mineral content of soils, field and pot experiments in soil fertility, peat soils, soil organic matter, pasture and forest soils, and lysimeter studies of soil drainage. The Ministry of Agriculture for Northern Ireland took up methods for the determination of manurial requirements and the response to lime. At the Imperial College of Science and Technology, the Research Institute of Plant Physiology studied the effects of mineral deficiency on barley and the relation of water content and mineral deficiency; after effects of temperature on winter cereals; control of transpiration; the relation between stomatal aperture and assimilation rate; electroculture; temperature and root absorption; light and the rate of growth; and physiological studies of tomato seedlings and sugar beet and mangel plants.

Other subjects covered by the institutes in much the same fashion included plant breeding, crop varieties, and seeds; horticulture and glasshouse crops; entomology and plant pathology; agricultural parasitology; animal pathology; animal nutrition and breeding; dairying; agricultural economics; preservation and transport of agricultural products; and agricultural engineering. Many somewhat less comprehensive projects were also reported from the advisory centers, 14 centers working on chemistry, 15 on entomology, 16 on mycology and botany, 12 on veterinary science, 13 on agricultural and dairy bacteriology, 14 on economics, and 1 on grassland; and from various points on 34 special projects in plant breeding and cultivation, plant diseases and pests, dairying and animal husbandry, animal diseases and pests, food products, and miscellaneous work.

Judging by the index references, one of the most common subjects of investigation was apples, for which there are 82 entries, dealing with such phases as bark ringing, biennial bearing, rootstocks, diseases and insect pests, and storage problems. Spraying was a particularly popular topic, with 128 entries, as were also canning and strawberries. Milk and poultry were outstanding subjects in animal production, and much interest was evident in eelworms and other animal parasites. Animal diseases most widely studied included contagious abortion, blackhead of turkeys, fowl paralysis, gastritis of cattle and sheep, mastitis, and tuberculosis.

The results of these investigations found publication in many ways, but for the most part in technical journals. Lists of titles of papers published during the year showed an impressive total of 781. Of this number 77 were from Rothamsted, followed by 55 from the East Malling Research Station on pomology, mycology and bacteriology, entomology, biochemistry, physiology, hops, and miscellaneous; 48 from the National Institute for Research in Dairying; 41 from the Long Ashton Fruit Research Station; 34 from the John Innes Horticultural Institution; and 32 from the Institute of Animal Genetics.

Even casual examination of either the projects or the publications reveals a number of points of general interest. A wide range of subjects is being covered, and material progress is being made. There is a well-proportioned relation between the fundamental and the immediately practical. Few indications of anything approaching regimentation of research are to be noted, yet there are many instances of interinstitutional cooperation and an avoidance of undue duplication. The system seems to be functioning very successfully, and doubtless is well adapted to the needs of the constituency which it directly serves.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical and bacteriological investigations of the New York State Station] (*New York State Sta. Rpt. 1935, pp. 26, 27, 40–42, 43, 48, 49*).—These have included fruit juice pasteurization studies, sauerkraut investigations, identification of the bacteria causing lactic fermentations, cider and wine making, grape juice, and beverages from rhubarb and cherry juice, maraschino cherries, pectin and pectic enzymes, grading canned peas by their alcohol-insoluble solids content, the fat content of corn products, casein investigations, studies of protein plastics, and an investigation of the influence of salts on the properties of proteins.

Investigations on the iodine problem in Westfalen (Westphalia) [trans. title], R. Balks (*Landw. Jahrb., 81 (1935), No. 6, pp. 939–1002, figs. 2*).—The author reports at some length upon a thorough investigation of the iodine content of the rocks, soils, drinking waters, and the milk and other of the more important foodstuffs of all parts of the Province of Westfalen; upon plant culture experiments carried out at the Münster Experiment Station to show the effect of the relative iodine content of soils upon that of certain important food plants grown upon them; and upon a comparative investigation of the iodine content of the soils and foodstuffs of goiter-free and of goiter-affected areas. The report contains a soil map of the Province and numerous rock, soil, and crop analyses.

The iodine content of the rocks and soils examined was found relatively high, that of the stream and spring waters normal, and that of the milk samples analyzed rather high. The iodine content of the plants (rye) experimentally grown on the various soils showed a wide range of variation, however; and a certain degree of parallelism between the iodine intake of the experimental plants and the quantities of iodine extractable from the soils by means either of water or of potassium carbonate solutions was noted. Comparative determinations of the iodine content of crops and soils from goiter-free regions and from areas either slightly or markedly affected by goiter showed the iodine content both of the soils and of the crop plants most heavily consumed by the population to be importantly less in the regions in which goiter was found endemic.

Heats of solution, heats of dilution, and specific heats of aqueous solutions of certain amino acids, C. A. Zittle and C. L. A. Schmidt (*Jour. Biol. Chem., 108 (1935), No. 1, pp. 161–185*).—This contribution from the University of California continues the record of a general investigation (E. S. R., 72, p. 291) of the thermodynamic properties of the amino acids. Measurements of the specific heat of solutions of glycine, *dl*-alanine, and *dl*-valine are reported. The partial molal heat capacity of solvent and solute and the effect of temperature change on the heat of dilution were calculated from the specific heat measurements. Heats of solution and dilution obtained by direct measurements for 18 amino acids are also reported. These measurements were used to calculate the heat content of solvent and solute and the change in heat content accompanying solution (heat of solution).

A saponin from the soy bean, R. C. Burrell and E. D. Walter (*Jour. Biol. Chem., 108 (1935), No. 1, pp. 55–60, figs. 2*).—In an investigation reported from the Ohio State University the authors developed an improved method for the extraction of a saponin from soybean meal, and obtained from the saponin by prolonged hydrolysis a sapogenin which apparently contains a terpene grouping, galactose, and possibly rhamnose.

For the extraction of the saponin 4 kg of finely ground soybean meal were heated under reflux for 1 day with 5 l of 80 percent alcohol at from 50° to 70° C. The alcoholic extract was decanted and pressed out, and the alcohol was distilled off from the combined filtered extracts. The "heavy liquid remaining was placed in an electrodialyzer, and about 200 cc of water were added. After being dialyzed at 100 v for 24 hr., the supernatant liquid was siphoned off, and the precipitate was filtered out and dried in an evaporating dish on the steam bath. The dried residue was placed in extraction thimbles and extracted with ether in a Pickel extractor for 24 hr. The residue was then dissolved in 70 percent ethyl alcohol, and after being clarified with Darco the solution was concentrated to about half its volume. On standing, crystals separated. The crystals taken directly from the mother liquor appeared as rosettes under the microscope. On repeated recrystallization and drying in a desiccator over concentrated H_2SO_4, they assumed the form of very thin plates which melted with decomposition at 220°–225°."

Some physical and chemical properties of both the saponin and the sapogenin, including the optical properties of crystals of the sapogenin, are reported. Attention is called to the probable identity of several recently reported saponin preparations from the soybean.

Specificity and inhibition characteristics of liver esterase and pancreas lipase, H. H. R. Weber and C. G. King (*Jour. Biol. Chem., 108 (1935), No. 1, pp. 131–139, figs. 4*).—According to these observations, with increasing chain length the inhibitory power of the salts of the normal fatty acids for liver esterase increased up to sodium laurate and then decreased to practically zero for the palmitate and stearate. The decrease in inhibitory power coincided with the formation of micelles or colloidal aggregates and decreasing power to lower surface tension. The inhibitory effect of the soaps was much less than that of the corresponding alcohols.

Effects of other salts and of certain of the ethers of ethylene and diethylene glycol are also dealt with.

Oxidation-reduction indicators.—I, Diphenylbenzidine sulfonic acid, L. A. Sarver and W. von Fischer (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 4, p. 271*).—The indicator obtained in the synthesis here reported from the University of Minnesota was found to contain 10 sulfonic acid groups in the case of most of the preparations. It was made by direct sulfonation of diphenylbenzidine at a temperature not allowed to exceed 40° C. The indicator was found to be very satisfactory and to show color changes as follows:

"When diphenylbenzidine sulfonic acid is fully oxidized by dichromate, permanganate, or ceric sulfate, reddish violets are produced which are stable but which fade after a long time. Bromine yields blues which fade very rapidly. The half-oxidized green form, on the other hand, is extremely stable and does not precipitate out on standing, as was the case with that resulting from diphenylamine or diphenylbenzidine. Absorption curves were determined . . ., the violet form giving one similar to that for diphenylamine sulfonic acid violet, with a maximum at 5,600 a. u., while the green has a minimum at this point and absorbs strongly at both ends of the visible spectrum."

Determination of the mineral content of soil colloids, E. Truog and M. Drosdoff (*Amer. Soil Survey Assoc. Bul. 16 (1935), pp. 136–138*).—A method devised at the University of Wisconsin involves separation of colloid from soil, separation and determination of free silica and free alumina, separation and determination of free iron oxides, removal of free sulfur introduced by the use of hydrogen sulfide in the preceding stage, determination of exchange capacity, saturation of muscovite to normal potash content, and a total analysis, including determinations of silica, potassium, iron, aluminum, titanium, and magnesium.

"While the procedure outlined is a tentative one, and undoubtedly still needs much refinement, the results are at least interesting and suggestive."

The non-protein nature of a fraction of soil organic nitrogen, A. W. J. Dyck and R. R. McKibbin (*Canad. Jour. Res., 13 (1935), No. 5, Sect. B, pp. 264–268*).—It is shown that not all the nitrogen in organic soils is determinable by the Kjeldahl method. In every sample tested the Dumas method indicated a considerably higher percentage of nitrogen. The differences in nitrogen content, as shown by the two methods, vary from 6.4 to 29.6 percent, "hence it is believed that an appreciable fraction of the soil organic nitrogen may be of nonprotein nature."

Determination of molybdenum in plants and soils, K. E. Stanfield (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 4, pp. 273, 274*).—In a contribution from the University of Wyoming a gravimetric method for the determination as lead molybdate of molybdenum in plants and soils in amounts exceeding 5 mg is described, together with a colorimetric method, based upon the extraction of the red-colored molybdenum thiocyanate by butyl acetate, for the determination of molybdenum in plants and soils.

Studies in starch amylase viscosimetry.—I, A sensitive precision method for the estimation of amylolytic activity applicable to human serum, W. R. Thompson, R. Tennant, and C. H. Wies (*Jour. Biol. Chem., 108 (1935), No. 1, pp. 85–104, figs. 3*).—This contribution presents a generalized method for evaluating catalytic activity from digestion curves and points out that this procedure may be applicable to many other systems. Automatic methods which lead to great simplification in technic in respect both to observation of digestion and to evaluation are suggested and applied.

A precise method of estimation of amlyase, applicable to human serum, is described. $CaCl_2$ is included in substrate preparations to avoid instability of the enzyme and in order that the additive law may hold at least approximately when human serum and pancreatin are both in the reaction mixture.

Determination of peroxidase activity, D. A. Pack (*Indus. and Engin. Chem., Analyt. Ed., 6 (1934), No. 3, pp. 170, 171*).—To secure optimum conditions for peroxidase activity, the author found various modifications of the procedure employing an α-naphthol-*p*-phenylenediamine mixture as the substrate to be needed, and arrived at the following as a satisfactory method:

"Care should be exercised to obtain comparable samples of the product for both dry-weight and peroxidase determinations. The weighed peroxidase sample should be ground thoroughly with fine sand and afterwards made up to a definite volume with water or buffer solution. A measured volume of this enzyme solution is boiled for 20 min. to destroy the peroxidase and then made up to the measured volume for peroxidase-free samples and indicated as the blank solution. A required volumetric sample of the enzyme solution is placed in a 100-cc flask, and to this are added 6.25 cc of the substrate solution containing 0.02975 g of *p*-phenylenediamine hydrochloride in water with 0.595 cc of 4 percent *a*-naphthol in 50 percent alcohol. (Solutions are made up in these proportions for several samples at one time, brought together, and filtered just before using.) The reaction is started by the addition of 8.75 cc of a solution containing 6.25 cc of the optimum pH buffer and 2.5 cc of 0.05 N hydrogen peroxide. The reaction progresses at 25° C. for 10 min. and is stopped by the addition of 2.5 cc of a 0.1 percent aqueous solution of potassium cyanide. A blank determination, made up from all the reagents and the required volume of the blank solution, is carried along with each peroxidase sample. The indophenol produced is dissolved in toluene and separated from the aqueous solution by centrifugalizing for 1 min. The amount of indophenol in the sample is determined by colorimetric comparison with a standard containing 50 mg of indophenol per liter of toluene. The amount of indophenol produced by the sample, less that produced by its blank, gives the initial peroxidase activity. From the dry-weight determination, the peroxidase activity is reported as milligrams of indophenol per decigram of dry substance in the peroxidase sample."

A method for determination of saccharase activity, J. B. SUMNER and S. F. HOWELL (*Jour. Biol. Chem., 108 (1935), No. 1, pp. 51–54, fig. 1*).—This contribution from Cornell University presents a brief account of the development of a method for which the following directions are given:

"Pipette 5 cc of 6.5 percent sucrose in acetate buffer into a test tube and allow to come to 20° [C.] in a thermostat bath. Add 1 cc of saccharase solution, or yeast suspension, at 20°, from a Folin-Ostwald pipette that delivers rapidly. Mix and allow to remain in the bath for 5 min., after which add 5 cc of approximately 0.1 N sodium hydroxide. Mix and determine the invert sugar in a 1 cc aliquot by the [senior author's] dinitrosalicylic acid method,[1] with a 1-mg glucose standard. The milligrams of invert sugar multiplied by 11 will give the saccharase units per cubic centimeter of enzyme solution or yeast suspension. If considerably more than 1 or less than 0.5 mg of invert sugar is found per cubic centimeter, the analysis will have to be repeated, with more dilute or more concentrated saccharase, or else with a longer or a shorter time for the digestion."

To prepare the acetate buffer solution in which the sucrose solution is made up, place 43 cc of N sodium acetate and 57 cc of N acetic acid in a liter volumetric flask; dilute to the mark with water redistilled from glass and mix. Dissolve 6.5 g of C. P. sucrose in 96 cc of the buffer and add a few drops of toluene. "This will give a 6.5-percent solution of pH 4.5. The solution will remain serviceable at room temperature for 3 days." Of the sugar standard it is noted that "we have not found any detectable difference between the reducing values for invert sugar and *d*-glucose by the dinitrosalicylic acid method. We therefore employ the usual standard containing 0.1 percent glucose in saturated benzoic acid."

Technique for the study of tryptic-ereptic digestion of proteins, B. SURE, M. C. KIK, and K. S. BUCHANAN (*Jour. Biol. Chem., 108 (1935), No. 1, pp. 11–18*).—A method for the study of tryptic-ereptic digestion of casein with pancreatic and intestinal extracts of the albino rat is described by the authors, from the University of Arkansas, according to whom their method is applicable to other pure proteins.

It was found that the rat pancreas contains about 80 percent of its trypsinogen in the activated form, or trypsin, "which indicates that enterokinase, generally found in the mucosa of the small intestines of mammals, is abundant in the rat pancreas."

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[1] Jour. Biol. Chem., 65 (1925), No. 1, pp. 393–395.

The determination of glucuronic and galacturonic acids by Bertrand's method, Z. I. Kertesz (*Jour. Biol. Chem., 108 (1935), No. 1, pp. 127–129*).—In connection with an investigation of the decomposition of pectins, at the New York State Experiment Station, the copper reducing values for the estimation of glucuronic and galacturonic acids were determined. A table for the determination of from 10 to 100 mg of glucuronic and galacturonic acids by the Bertrand method is presented.

The determination of sodium in human red blood cells, F. W. Oberst (*Jour. Biol. Chem., 108 (1935), No. 1, pp. 153–160*).—The sodium content of human red blood cells has been determined by a direct method with the sodium-zinc-uranyl acetate procedure at the Iowa State University. The cells were washed with isotonic KCl or with nearly sodium-free dialyzed serum made isotonic with potassium salts, and equilibrated with approximately 40 mm of CO_2. Protein was removed by means of trichloroacetic acid or by ashing. Phosphates were removed by precipitation with powdered calcium hydroxide.

The working detail of the precedure is prescribed.

A method for estimating the volatile sulphur content and pungency of onions, H. Platenius (*Jour. Agr. Res.* [*U. S.*], *51 (1935), No. 9, pp. 847–853, fig. 1*).—An investigation carried out at the [New York] Cornell Experiment Station has resulted in the development of a new and relatively simple method for estimating the volatile sulfur content and pungency of onions. This method is based on the assumption that onion oil has a definite chemical composition, and that differences in the pungency of onions are due solely to quantitative differences in the amount of oil present and, indirectly, to the volatile sulfur content. "The method possesses sufficient accuracy for the purpose, but since it involves steam distillation it is time-consuming and cannot be recommended as routine procedure when a large number of samples is involved."

Onion oil (almost entirely allyl propyl disulfide) is steam distilled into saturated bromine water in which the sulfur of the organic compound is oxidized to sulfate. After completion of the reaction the bromine is driven off and the sulfate is determined as barium sulfate.

AGRICULTURAL METEOROLOGY

Physical and dynamical meteorology, D. Brunt (*Cambridge Eng.: Univ. Press, 1934, pp. XXII+411, figs. 112; rev. in Sci. Prog.* [*London*], *30 (1936), No. 119, pp. 540–546*).—The purpose of this book is stated to be "to provide a textbook of physical meteorology suitable for postgraduate students." It deals with the subject from the viewpoint that "meteorology, the science of things in the atmosphere, is concerned with the measurement and coordination of pressure, temperature, density, and humidity of the air, and of the motion of air relative to the earth. It seeks to explain the motions observed in terms of the changes of pressure, temperature, and humidity brought about directly or indirectly by the effects of incoming solar radiation."

The cycles that cause the present drought, H. P. Gillette ([*Chicago: Gillette Pub. Co., 1935, pp. 8, figs. 3*]; *rev. in Nature* [*London*], *136 (1935), No. 3430, pp. 150, 151; Bul. Amer. Met. Soc., 16 (1935), No. 8–9, pp. 192, 193*).—In a paper read at the June meeting of the American Meteorological Society, evidence was presented from tree rings, annual silt layers, or varves, of ancient glacial lakes, and other sources of 152- and 69⅔-yr. and other rainfall cycles. It is indicated that the 152-yr. cycle will reach its next precipitation minimum in 1939. The last minimum of the 69⅔-yr. cycle was in 1934. "These two cycles explain the present drought and indicate that its very severe effects will persist for at least 15 yr. longer. Ten other cycles, of about 2 to about 49 yr., that have been found in tree rings and varves, as well as a cycle of about 100 yr., are shown. . . .

"With two cycles (152 and 70 yr.) of such a great amplitude having almost coincident valleys, the extreme severity of recent drought years is understandable. . . . We are in the middle of one of those long dry periods so often mentioned in history, which in olden times caused famines, migrations, and wars. Averaged by decades, rainfall in general will be subnormal for about 40 yr." "Hence [the author states] it will be a waste of public funds to plant the proposed shelterbelt of trees from Canada to Texas. The seedlings will never reach maturity. Similarly, reforestation projects will be failures."

Dust blowing, A. D. Carlson (*Harper's Mag., 1935, July, pp. 149–158; abs. in Bul. Amer. Met. Soc., 16 (1935), No. 11, pp. 287, 288*).—Conditions prevailing on the Great Plains during the recent disastrous dust storms and their causes and possible correction are discussed. The author refers to the destruction of the range as "a tragic misstep" and to the conditions under which settlement of the plains has been allowed as "unspeakable bungling." Yet he also says, "in the face of the facts one is inclined to smile at the pessimists who have been asserting that the plains are turning back permanently into the desert from which they came." While great temporary and local damage has been done over a wide area, the crop-producing capacity of the region as a whole cannot be said to have been permanently reduced. However, "nothing but scientific planning and a fairly close central control of the economic activities of the area can make it really serve human needs."

Lake deposits in the Crimea and the rainfall of Europe since 2000 B. C., C. E. P. Brooks (*Met. Mag. [London], 70 (1935), No. 834, pp. 134–138, figs. 2*).—From measurements of annual layers of mud deposits in Lake Saki, the author deduces what appears to be a definite relation between such layers and fluctuations in rainfall to a remote period. "Apart from the very earliest figures, the fluctuations are of the same order of magnitude throughout, except for the two maxima in the Middle Ages. All the other curves show an increasing amplitude with increasing age." Although the data seem to offer significant indications in harmony with observations on the growth history of vegetation, the author warns against "too ready generalizations on the 'climate' of long stretches of time."

Rainfall records for the Sonoran Desert, T. D. Mallery (*Ecology, 17 (1936), No. 1, pp. 110–121, figs. 2*).—From rainfall data collected at different places and elevations in the Sonoran Desert of Arizona, California, and Sonora, Mexico, since 1903, the author concludes that "while a knowledge of the total annual rainfall at any given place serves as a fundamental starting point for the scientific treatment of the climate of that region it does not give the distribution of the individual storms. The distribution is more important from the standpoint of the vegetation and of erosion than is the total yearly amount." The data obtained emphasize the fact that "the irregularity of the rainfall in desert regions greatly increases the adverse character of the conditions for plants and that there is little relation between annual rainfall totals and the amount of moisture in the soil. Data are presented which show conclusively the importance of the duration of a storm, the relative dryness of the ground surface at the moment the rain starts, and the weather conditions immediately following the rain in determining the amount of penetration and run-off. Rains of less than 0.15 in. were found to be ineffective in increasing the soil moisture at 15 cm unless they fall on soil which is moist and are followed by cloudy weather. Run-off does not usually accompany rains of less than 0.75 in."

The need of further study of the subject is suggested.

Wind data for wind mills, V. Doraiswamy Iyer (*India Met. Dept. Sci. Notes, 6 (1935), No. 63, pp. 57–85, pls. 7; abs. in Sci. Abs., Sect. A—Phys., 38 (1935), No. 452, p. 811*).—"Monthly normals of wind velocity for 205 observatories in India and a few stations in the neighboring countries are given, and the distribution of wind velocities in the different seasons is illustrated by charts. Curves of the diurnal variation of wind velocity at 22 stations for the four seasons are given. Tables giving the frequencies of occurrence of winds of different speed ranges and of days with different total duration of wind speeds exceeding 6 miles per hour, which is considered the minimum for working a windmill for agricultural purposes, have also been prepared for 15 stations. The data presented are briefly discussed."

The results of the study confirm the conclusion that over the greater part of India, including all of northern India, the energy of the wind is of no practical value, but that there are many places in Peninsular India where it might be profitable to make use of windmills for irrigation.

Relations between crop yields and meteorological factors in Belgium [trans. title], R. Berce and R. Wilbaux (*Bul. Inst. Agron. et Stas. Rech. Gembloux, 4 (1935), No. 4, pp. 350–365, figs. 5; Dutch, Ger., Eng. abs., pp. 364, 365*).—This article reveals certain rather definite relations between meteorological factors—temperature, solar radiation, and rainfall—and the growth and yield of winter grain and potatoes in the region of Gembloux, Belgium, as, for example, the apparent dependence of yields of grain on mean temperature in July and of potatoes on rainfall at planting time.

Some aspects of climate and insect ecology, J. Davidson (*Jour. Aust. Inst. Agr. Sci., 1 (1935), No. 3, pp. 105–108*).—This article discusses briefly the effects of heat, moisture, light, air movements, and barometric pressure on the occurrence and distribution of insects, particularly in dry areas, also the influence of climatic factors on the distribution of soil types and vegetation with which insect life is closely associated. An attempt to develop a dependable index of aridity is also explained. The author concludes in general that "annual values for these climatic elements are inadequate for ecological investigations, especially in Australia owing to the seasonal character of the rainfall. On the other hand, monthly values would appear to be helpful in studies relating to the seasonal occurrence and distribution of insects."

The climate and weather of East and Central Africa, [I], A. Walter; **The climate and weather of East Africa, II, III**, W. A. Grinsted (*East African Agr. Jour., 1 (1935), Nos. 1, pp. 87–89; 2, pp. 165–168, fig. 1; 3, pp. 248–250*).—This is an account of the climate and weather of East and Central Africa, based upon the daily synoptic weather charts of the British East African Meteorological Service, with a brief description of the general climatic conditions of the area, dividing it into five climatic zones—coastal, lake, inland plateau, highland, and northern frontier.

It is stated that the chief features of the climate of the coastal zone are fairly high temperature with small daily and annual range, constantly high humidity, and maximum rainfall about April and May. The lake type of climate is very similar to the coastal type. The inland plateau is characterized by a large diurnal range of temperature and humidity, a wet season from December to April with a tendency for a secondary minimum in January, and a definite dry season from June to September. The highland zone tends to be cloudy with a fairly small diurnal range of temperature. The rainfall is very variable. The climate of the northern frontier zone approximates that of a desert over a great part of its area.

Conditions which affect humidity, pressure, wind velocity, and rainfall are briefly considered, as is the general organization of the meteorological service referred to, with special reference to the climatic and weather studies which this series of articles reports.

It is stated that the most important climatic factor in East Africa is rainfall, of which three types are differentiated and defined—frontal, orographic, and convectional.

Fine, clear weather usually prevails in the northern winter, especially in January, but in the other half of the year in the south there is an incursion of cold air associated with active trade winds, which results in rain and mist on the coast and on the hills.

SOILS—FERTILIZERS

[Soil and fertilizer work by the Arkansas Station] (*Arkansas Sta. Bul. 323 (1935), pp. 18, 19, 22–24*).—This station reports work on the availability of rock phosphate, by R. P. Bartholomew; restoring neutrality of soil, by M. Nelson; and nutrient solutions for rice, the effect of fertilizers on yield and growth of rice, and the availability of rice soil elements in submerged soils, all by L. C. Kapp.

[Committee reports received at the fifteenth annual meeting of The American Soil Survey Association] (*Amer. Soil Survey Assoc. Bul. 16 (1935), pp. 140–150*).—These reports include those of committees on nomenclature, by G. W. Conrey et al.; exchange of soil profiles, by H. J. Harper et al.; soil conservation, by J. G. Hutton et al.; edaphic relationships, by M. F. Morgan; reports, maps, and technic of mapping, by H. W. Higbee et al.; land use, by C. E. Kellogg; soil geography, by M. Baldwin et al; horizon criteria, by E. A. Norton; and organic and forest soils, by J. T. Auten.

A classification of natural land-types according to productivity, based on the soil survey, C. P. Barnes (*Amer. Soil Survey Assoc. Bul. 16 (1935), pp. 36–38*).—The U. S. D. A. Bureau of Agricultural Economics reports briefly upon a scheme, of which it is stated, in part, that "this plan consists in relating the productivity of each land type for a given crop to a national standard, namely, the most productive land type in the country for the crop. The relationship is expressed by means of indexes in which the naturally most productive land type receives a base index of 100, land half as productive an index of 50, and so on. Such a scheme not only permits evaluation of the productivity of different land types within a locality or county but also makes possible comparisons of the productivity of land types in widely separated regions.

"A natural land type is defined as a kind of land having essential uniformity of physical characteristics or environment, or, more specifically, uniformity in characteristics of soils, surface, configuration, and climate. In some instances soil types coincide with land types, in others land types embrace parts of soil types."

Essentials of a general system of classifying organic soils, A. P. Dachnowski-Stokes (*Amer. Soil Survey Assoc. Bul. 16 (1935), pp. 105–109*).—A discussion contributed from the U. S. D. A. Bureau of Chemistry and Soils takes up first the subject of the definition of peat and muck as organic soil materials and proceeds to a consideration of peat profile variations, the basis for major divisions, and the main categories of an organic soil material classification. The latter include major groups, subgroups, divisions, subdivisions, relative maturity, series, and type units of peat and muck.

Terms indicating origin of soils, C. F. Shaw (*Amer. Soil Survey Assoc. Bul. 16 (1935), p. 4*).—In view of the fact that "the terms 'sial' and 'sima' are now rather generally used in geology, the former indicating the lighter silica-alumina rocks generally classed as 'acid igneous' while the latter indicates the rocks containing larger quantities of calcium and magnesium that are generally referred to as basic igneous rocks," the author of this note from the University of California proposes "the term siallithous to indicate soils derived from acid igneous rock sources and simalithous to indicate soils derived from basic igneous rock sources. With these terms, it would seem logical to use the term arenalithous to indicate soils derived from sandstones, argillithous to indicate those derived from shales, and calcilithous for the soils derived from limestones. If in practice it is found that many soil series are derived from a mixture of sandstones and shales, it might seem desirable to use the combined term arenargillithous, or arenalithous could be used to cover both sandstones and shales where the sandstones dominate, and either argilarenalithous or argillithous could be used to cover both provided the shales predominated. Following the same reasoning, it is suggested that heterolithous be used to indicate soils of mixed geological origin, as, for instance, stream alluvium, aeolian materials, or glacial deposits where the mineral constituents are thoroughly mixed and not dominated by any one geological rock source." The author believes that the use of the proposed terms should eliminate some confusion and misunderstandings in references to the origins of soils.

New soil series names 1933–34, C. F. Shaw (*Amer. Soil Survey Assoc Bul. 16 (1935), p. 6*).—The author submits a list of 92 soil series names recently established. It is noted that all soil survey organizations throughout the world are in cooperation to avoid duplication of series names, that this effort has prevented potential duplications in the naming of soils included in the present list, but that the Glenn, Hamilton, and Norfolk soils of New Zealand, here listed, have names which do constitute a duplication of designations already in use in the United States.

What characteristics distinguish Pedalfers from Pedocals? C. F. Shaw (*Amer. Soil Survey Assoc. Bul. 16 (1935), p. 5*).—A brief note from the University of California points out that various criteria for differentiating the two great soil groups named are logically possible. Examples of soils the assignment of which to either group presents difficulties are briefly stated. It is concluded that "the problem that we face in the application of the terms 'Pedalfer and Pedocal' is a very real one, and it would seem highly desirable that the men working in the field of soil science and particularly on taxonomic problems should decide upon definite standards for these two exceedingly important terms and establish criteria upon which decisions could readily be made."

The meaning of the term Solonetz, W. P. Kelly and C. F. Shaw (*Amer. Soil Survey Assoc. Bul. 16 (1935), pp. 1–3, figs. 2*).—A discussion contributed from the University of California brings together the definitions and descriptions of Solonetz put forward by numerous investigators, and calls attention to a considerable discrepancy between the meanings assigned to the term. The concept of a Solonetz soil which is characterized both by the percentage of saturation of the exchangeable complex with sodium and by the morphological feature of a columnar B horizon is challenged on the ground that the authors "have found, for example, that several different California soil profiles, each of which show well-developed Solonetz morphology, do not contain significant amounts of absorbed sodium. The colloidal absorption complexes of many of these soils are not only not saturated with sodium but contain relatively little absorbed sodium. In fact, the absorption complexes of many of these soils are practically saturated with calcium and magnesium. All the available evidence indicates that a sodium-saturated colloidal complex and the 'Solonetz' morphology are not coexistent in these soils."

As a conclusion from the discussion as a whole, it is pointed out that "the two interpretations of the term Solonetz are not in agreement and that the continued use of the term from these two markedly different viewpoints will lead to much confusion. It would seem desirable either to establish a definition of the term Solonetz on which both morphologists and chemists can agree or to drop the use of the term from soil terminology."

Factors contributing to the genesis of soil micro-structure, L. D. Baver (*Amer. Soil Survey Assoc. Bul. 16 (1935), pp. 55, 56*).—From some observations reported from the University of Missouri, the author concludes that "it seems that the organic matter in soils (excepting lateritic soils) is one of the major causes of stable soil granulation. The clay content also plays an exceedingly important part. In lateritic soils it appears that the colloidal Al_2O_3 and Fe_2O_3 exert significant effects on the formation of secondary soil particles." Removing the calcium content of certain Chernozem soils, entirely saturated with calcium, by leaching with 0.001 N hydrochloric acid and washing the soils free from the acid left the percentage of aggregates apparently unchanged.

Morphology of the reddish yellow soils in southeastern United States, R. C. Jurney (*Amer. Soil Survey Assoc. Bul. 16 (1935), pp. 57–59*).—Selecting for discussion a small portion of the Piedmont Plateau, the author takes up the geological origins of the soils and describes, as an example of the soils having a yellow B horizon, the Durham profile; as representing the reddish-yellow B horizon, the Appling profile; and, of the soils having a red B horizon, the Cecil profile. Of the intermediate Appling soil, it is stated that:

"Three explanations of this soil may be given, the one being that it is an intermediate development between the younger Durham soil and the older Cecil soil. Another is that in the parent rock material iron-bearing minerals are lacking or occur in smaller quantities than in the Cecil material. In districts where granite is the main rock formation, it has been observed that both Appling and Durham soils have a large representation. A third explanation is that the soil is a product of leaching. In this case it is assumed that the Cecil had reached the maximum in development, and the forces of leaching having won, the result was the reddish-yellow profile of the Appling. According to this, a further leaching of the soil would produce the yellow Durham soil. Two characteristics of the soil lend authority to the latter explanation. The one is the prevailing thickness of the sandy A horizon of the Appling or Durham. It is almost everywhere deeper than that of the normal Cecil, and this condition may be indicative of a longer period of leaching. Another feature is the streaked varicolored appearance of the lower part of the B horizon. This possibly indicates that leaching has taken place in the heavy layer.

"Thus the reddish-yellow soil appears to occupy an intermediate stage between the yellow soil and the red soil. The evidence would seem to indicate that it is probably a product of the leaching process, and that this process throughout the region acts as a modifying agent upon the normal soil profile."

Genesis and morphology of the red soils in the southeastern United States, O. C. Bryan (*Amer. Soil Survey Assoc. Bul. 16 (1935), pp. 66–69*).—A brief statement of the geographical location and environment and morphological characteristics of the soils in question is given, together with the author's views as to their genesis, in a discussion from the University of Florida in which are also included descriptions of eight profiles. It is stated, in part, that "the nature of the soil-forming material seems to have little, if any, influence on the soil color, providing the iron compounds are dehydrated in the parent material. That is, any parent material, viz, limestone, granite, sandstone, or shale, may develop into a red-colored soil under the climatic conditions of this belt. The ferric oxide develops as a result of natural soil processes, thereby giving a red pigment or color to the soils, and the climatic forces are not sufficient to hydrate this compound to the yellow form. The yellow soils in this belt, including the Norfolk group in the Coastal Plain, appear to be due to the hydration of the iron under conditions of poor drainage."

"Terra Rossa" and Red loams and their relation to other zonal soil types, J. S. Joffe (*Amer. Soil Survey Assoc. Bul. 16 (1935), pp. 60–65*).—This discussion, contributed from the New Jersey Experiment Stations, brings together analytical data obtained by various investigators and representing red soils of widely separated regions, and considers the indications of the available information with respect to the nature and genetic relationships of Terra Rossa and other red soils.

The aggregation of desert soils, L. D. Baver and W. G. Harper (*Amer. Soil Survey Assoc. Bul. 16 (1935), p. 54*).—A note from the U. S. D. A. Bureau of Chemistry and Soils and the University of Missouri reports an examination of five desert soils from Arizona. These soils (Mohave loam, sandy loam, clay loam, and clay, and Laveen loam) "are characterized by a low percentage of clay as a result of physical weathering rather than chemical. The organic matter content is also very low; the soils only average 0.45 percent carbon. Because of these two factors, namely, a small percentage of potential aggregate material and a low amount of the granulation agent (organic colloids), we find only 6.5 percent of aggregates larger than silt in the entire soil. Moreover, only 13.7 percent of the clay and silt present is in the form of stable aggregates. Even though the percentage of aggregates present is small, a graphical analysis of the data shows a close correlation between the aggregation that is present and the organic matter."

Peat soils of California, S. W. Cosby (*Amer. Soil Survey Assoc. Bul. 16 (1935), pp. 102–104*).—The author of this contribution from the University of California concludes from a study of published work that there has been "no clear-cut recognition of the distinction between peat, on the one hand, and organic soils, on the other." He maintains the need for such a distinction and, after describing the peat of six series of peat soils of progressively greater maturity and one of the mineral soils of the Delta region, shows that it is possible to classify organic soils into primary and secondary suborders, each including classes, divisions, stages, families, series, and types, the two last-named subclassifications being differentiated by criteria the same as those governing the classification of mineral soils. As one of the examples of the operation of this system, it is noted that "the five members of the Roberts family exhibit the typical development and very close relationship which are reflected in the several series included in a family of mineral soils."

The origin of horizons in claypan soils, R. H. Bray (*Amer. Soil Survey Assoc. Bul. 16 (1935), pp. 70–75, figs. 3*).—At the Illinois Experiment Station a chemical study of soils formed in the nearly level upland prairie region of central Illinois showed that the major features of soil formation in this region are "(1) a slow weathering under slightly acid to slightly alkaline conditions, producing as a chief product a secondary colloidal silicate, and free oxides of Fe, Al, and Si as byproducts; (2) slow continuous leaching, resulting generally in the removal of bases but under special conditions in the local accumulation of sodium forming slick spots; and (3) the downward movement through cracks and root channels, as a result of water action, of discrete particles of the superfine fraction of a high-ratio colloidal silicate." It was further shown that this movement and disposition of superfine colloidal silicate is chiefly responsible for horizon formation, although other concomitant phenomena, including the segregation of iron in concretionary form in both alkaline and acid horizons, were also observed. "This type of soil formation has been designated as 'silicatic', a subtype under podsolic." The progressive nature of these processes is indicated in a comparison of various stages.

A chemical and physical examination of the colloidal silicate "has led to the following conclusions: (1) The $\frac{SiO_2}{R_2O_3}$ ratio (3:0), petrographic constants, and X-ray pattern are those of the beidellite-nontronite type of clay mineral. (2) The base (Mg) content and base-exchange properties point to an isomorphous series of which it is a member, which at the peak base-exchange capacity, 89 m[illigram] e[quivalents], agrees with the formula

$$RepO . MgO . (Al_2O_3)_6 . (H_2O)_n."$$

The mechanism of clay pan formation is interpreted as that of a dispersion by mechanical forces (mainly those of the rapid movement of water at the beginning of a rainfall), followed by movement, and redeposition when these forces become ineffective.

Aggregation studies on the Muskingum, Chester, and Lansdale silt loams, A. H. Paschall, R. T. A. Burke, and L. D. Baver (*Amer. Soil Survey Assoc. Bul. 16 (1935), pp. 44, 45*).—The Soil Erosion Service, the U. S. D. A. Bureau of Chemistry and Soils, and the University of Missouri report observations showing that the A_1 horizon of a Muskingum silt loam is more highly granulated than the A_2 horizon of the same soil, and that in the cases of the Chester and Lansdale silt loams examined the percentage of aggregates present in forested areas of these soils is between two and three times that to be found in cultivated areas of the same soils. Of the Muskingum soil, it is further noted that, "since the texture of the two horizons is approximately the same, these differences are undoubtedly due to the higher organic matter content of the surface horizon." A statistical analysis of the data showed a significant correlation between the percentage of organic matter and the percentage of aggregates present, the correlation being especially high in the case of the silt and clay fractions. With respect to Chester and Lansdale soils, the authors record the similar observation that "these data . . . show that the texture of both the forest and cultivated samples was about the same. The organic matter content of the forest soils is more than twice as high as the cultivated soil. The percentage of aggregates present and the extent to which the finer mechanical fractions are aggregated likewise is between two and three times as high with the forest soils as compared with the cultivated."

Quick tests for phosphorus and potassium in relation to soil survey work, T. M. Bushnell (*Amer. Soil Survey Assoc. Bul. 16 (1935), pp. 76–80, figs. 8*).—Available phosphorus, potassium, and soil acidity tests are discussed in a contribution from the Indiana Experiment Station. Several common sources of error in the application of these tests are pointed out, but the opinion is also expressed that "in addition to the great possibilities of quick tests for their original purpose if used with understanding of the profiles and horizons being tested, they may become a good research tool which may help to solve taxonomic problems."

"Considerations for making soil survey work of greater value to farm mortgage loan investors", D. S. Gray and P. L. Gaddis (*Amer. Soil Survey Assoc. Bul. 16 (1935), pp. 25–32, fig. 1*).—From the point of view of land classifications to be used as bases for loans, the following manner of treatment is suggested for consideration in the soil type discussion: "The principal type of each series could be treated thus, with additional discussion of the other members of the same series in the respects wherein they differ from the principal member, pointing out, however, that they are otherwise alike.

"(1) Relief or position and topography; (2) origin and geology; (3) description of the soil profile in simple terms; (4) location and extent in the county; (5) relationships to associated types of soil; (6) utilization; (7) crop adaptation, yields, and cultural practices; (8) a careful discussion of the water requirement in irrigated areas; (9) problmes such as erosion, drainage, alkali, and seepage; (10) chemical character, fertilizer and lime requirements, and fertility problems; (11) careful discussion of land values; (12) photographs of typical developments of the type illustrating topography, utilization, average farmsteads, and general character; (13) photographs of a typical profile with discussion of horizons; (14) variations from the typical soil." Each point of this outline is briefly taken up, and a further general discussion follows.

Soil type as a basis for land appraisal in the Muskingum Watershed Conservancy District, G. W. Conrey (*Amer. Soil Survey Assoc. Bul. 16 (1935), pp. 42, 43*).—A system of land valuation devised at the Ohio Experiment Station is outlined and is illustrated by a soil rating chart for the Black Fork Reservoir area of the Muskingum Watershed. Of the valuation system, as here presented, the author notes that "it is recognized that the schedules as worked out are not perfect; we do not have the information to make them so. The method does have value in that it attempts to take into consideration the system of soil management as well as the inherent productivity value of the soil type. That it is a step in the right direction in attempting to work out land values seems self-evident."

World population centra in relation to soils, L. A. Wolfanger (*Amer. Soil Survey Assoc. Bul. 16 (1935), pp. 7–9*).—This is a general discussion of the relation of present and potential population centrums to the possibilities of the soil areas which support them. Undeveloped potentialities are especially emphasized, and the conclusion is reached that "despite its limitative character, the earth still offers enormous untouched opportunities for anyone who will but arm himself with the knowledge of its special capabilities."

The relation of soils to human environment in the Appalachian Valley ridges of south central Pennsylvania, H. W. Higbee (*Amer. Soil Survey Assoc. Bul. 16 (1935), pp. 10–15*).—The author of this contribution from the U. S. D. A. Bureau of Chemistry and Soils sketches the agricultural history of the soil area named, calls attention to the present need for the conservation of the soil resources, and shows the importance of resident ownership of farms as a factor in such conservation.

"Most of the agricultural lands of this region are in many ways similar to other agricultural lands that are located in the great Appalachian Valley ridge region that extends from New Jersey, through Pennsylvania, Maryland, Virginia, Tennessee, and into Georgia. The agricultural lands in these great valleys are in serious need of the protection of resident farm ownership that promotes the selection of agricultural cropping systems that aid in preserving our greatest natural resource, the soil."

"It is unfortunate that some of these very fertile soils are subject to serious erosion. This is most noticeable where the soils are a victim of absentee ownership and the 1-yr. land tenant system that promotes continuous cultivation and maximum soil erosion. It is not difficult to pick those farms that are operated by a resident owner. They are more intelligently managed, soil erosion is controlled or reduced by use of alfalfa or clover hay, or grass crops, on the more erosive slopes. The resident-owned farms are much more attractive and better cared for."

Soil types and the distribution of population in Otsego County, New [illegible] W. E. Tharp (*Amer. Soil Survey Assoc. Bul. 16 (1935), pp. 16, 17*).—The author finds that, giving due consideration to all conditions and influences affecting the distribution of population throughout Otsego County, the soil type stands out as the factor of first importance.

"Three provisional groups of soil types may be made: First, the upland types consisting chiefly of soils of sandstone derivation; a second group more or less alkaline; while the third embraces all types found in the valleys.

"In the valleys there are few unoccupied farms, and none have been abandoned. These homesteads in the river valleys show a remarkable stability with respect to ownership, acreage, and maintenance of improvements. There have been fewer transfers by sale or otherwise than is the case in most farm communities in the Midwestern States. These farms consist chiefly of soil types easy to till and rate comparatively high in productivity for all the usual farm crops. They also have a rather wide adaptation to fruits and vegetables. . . .

"Farms consisting wholly or in part of alkaline soils are rarely unoccupied, and none, so far as observed, were abandoned. Isolated patches of these alkaline soils occur in inconvenient locations, but some people are still there, and the land is in use. The Honeoye and Ontario silt loams are principal types in this group. . . .

"It is on the high uplands that the greatest changes in rural population have occurred. Now there are great acreages of smooth ridge crest and gentle slope that have not been plowed for many years. . . . The Lordstown, Lackawanna, Marden, Otsego, and Volusia are the principal soils of this upland group. These soils possess quite good physical properties, however, and the smoothest phases are not especially difficult to till. All, however, are strongly acid and inherently low in organic matter, while the ready response to fertilization indicates the lack of available plant nutrients that other indications confirm. The yield per acre of all crops is considerably below the State averages for the same products. These soils require much care and good management for crop returns that are considerably below those of either of the other two soil groups."

Notes on soils and human geography in China, J. Thorp (*Amer. Soil Survey Assoc. Bul. 16 (1935), pp. 18–24*).—The author, chief soil technologist of the National Geological Survey of China, outlines the relation of soil characteristics to population and agriculture under the main heads of climate, vegetation, and soils, the latter being divided into Pedocals, under which are included Chernozems and degraded Chernozems and Chestnut earths, and Pedalfers, inclusive of Brown soils, Gray-Brown forest soils, and Red soils. Soils and human geography and the famine districts are also among the topics touched upon.

The soil factor in commercial apple production in the Hudson Valley of New York, A. T. Sweet (*Amer. Soil Survey Assoc. Bul. 16 (1935), pp. 46–48*).—The author of this contribution from the U. S. D. A. Bureau of Chemistry and Soils finds that in the Hudson River Valley of New York commercial apple growing is confined very largely to two general types of soil, one of light sandy and gravelly texture underlain by sand and gravel permitting of good drainage and deep rooting, which is well represented in the Kinderhook section, and the other a type heavier in texture, less uniform in depth, but productive where well developed, and the principal orchard soil in the Germantown and New Paltz sections.

"In the Hudson Valley there is an abundance of good soil, if properly selected, for apple growing. Climate is favorable, and in the low expense of marketing growers have an advantage here over those of any other important apple-growing region."

The chemical composition of the colloidal fractions from the major soil series of Alabama, F. L. Davis (*Amer. Soil Survey Assoc. Bul. 16 (1935),* *p. 139*).—An abstract notes the compilation at the Alabama Experiment Station of "the silica-alumina ratios of the colloidal fractions, and of the total base-exchange capacities, the exchangeable calcium, and the percentage calcium saturation of the surface and subsoil horizons of 120 Alabama soils." Some inferences drawn from these data are also mentioned.

Soil solution changes in the arid profile, T. J. Dunnewald (*Amer. Soil Survey Assoc. Bul. 16* (*1935*), *pp. 93–96*).—The author finds that in the normal, mature, arid profile most of the water-soluble material is concentrated near the surface except immediately after rains. Descending water dissolves matter from all horizons of the arid profile, and when returning to the surface again loses material by absorption back into the soil.

"Such minerals as boron and selenium, having poisonous properties when livestock eat the vegetation containing them, are found in all horizons of a soil overlying the mineral-bearing shales. Selenium seems to be able to traverse the entire solum, both downward and upward, without being entirely absorbed from solution."

Forest lysimeter studies under pine, H. A. Lunt (*Amer. Soil Survey Assoc. Bul. 16* (*1935*), *pp. 86–92, figs. 3*).—This contribution from the Connecticut [New Haven] Experiment Station describes both tank and pan types of lysimeter so designed as to determine primarily the constituents leached out of the duff, and secondarily those leached out of the upper 4 in. of mineral soil. The construction, installation, and operation of these instruments is briefly dealt with.

The data here presented relate mainly to the moisture percolation and nitrogen recovery from 6 lysimeters of the shallow-tank type and 12 of the pan type, installed in a red pine plantation near New Haven. Of these, one-third received leachate from the litter only, one-third that from 4 in. of bare soil, and the remaining one-third that from 4 in. of soil and the overlying natural litter cover.

"The average rainfall recovery for the first year was greatest in the litter-only lysimeter (97.5 percent) and least in the soil-only (30.9 percent). So far, in the second year the soil-and-litter lysimeter is running a little higher than the litter alone, and the bare soil is yielding a larger proportion than it did the first year." From the pan type the amount recovered was very much less, particularly in the case of the soil and litter.

"Nitrate nitrogen content and conductivity were closely parallel, being highest in the bare soil and lowest in the litter. In general, the pH varied inversely with the nitrate content." Between 75 and 90 percent of the total nitrogen in the percolate from the bare-soil and soil-and-litter tanks was in the nitrate form. In the case of the litter-only tank, about 50 percent was in the organic form. During the first year the sum total of the nitrogen collected in the litter-only and the bare-soil tanks approximated the total collected from the soil-and-litter tanks. "So far in the pan type of lysimeters nitrate nitrogen has constituted a much smaller proportion of the total nitrogen than it has in the tank type."

The forest floor developed under conditions of summer rainfall deficiency in a Californian pine and fir forest, G. B. Bodman (*Amer. Soil Survey Assoc. Bul. 16* (*1935*), *pp. 97–101, figs. 2*).—The author of this contribution from the University of California finds that pine and fir floors "behave similarly with regard to their water relations, and possess so-called normal field capacities that are closely represented by their moisture equivalents. When expressed on the volume basis, which is the most significant method where watershed studies and erosion effects may be concerned, this quantity turns out to be, volume for volume, very close to that for the coarser mineral loams."

With respect to decomposition, it is noted, in part, that "the fir forest evidently contributes a litter which either in its fresh state is relatively high in nitrogen and lime as compared with the pine or else one which decomposes more rapidly. Probably both conditions are true, the former contributing to the latter, it being known that fresh plant materials having a narrow carbon : nitrogen ratio decompose more rapidly than those with a wide ratio. It is to be noticed, however, that beneath the forest floor, regardless of the forest type which forms it, the carbon : nitrogen ratio throughout the uppermost 15 in. of the profile is wide (between 15 and 20)."

Factors affecting the redox potential of soils, H. Kohnke and R. Bradfield (*Amer. Soil Survey Assoc. Bul. 16 (1935), p. 85*).—An abstract of an investigation carried out at the Ohio State University notes that "the object of this study was to determine the effect of various common treatments on the value and stability of the redox potential with the hope that the components responsible for the potential might be determined and improvements in the technic made. The results obtained, while of preliminary character, seem to indicate that the redox potential may be of considerable value for characterizing soils and for determining their relative suitability for growing certain crops." Attention is called, however, to the fact that the oxidation-reduction potential of most soils is not constant throughout the year but undergoes a cycle of seasonal changes, the amplitude of which "is determined largely by the degree of saturation with water, the temperature, and the amount and nature of the organic compounds present."

Base exchange properties of some typical Texas soils, G. S. Fraps and J. F. Fudge (*Texas Sta. Bul. 520 (1935), pp. 23*).—The absorption of ammonia from ammonium acetate was used to measure the base exchange capacity of about 360 soils representing the principal types of Texas soils. The ammonium acetate method was more accurate than either of the titration methods used.

"Variations in exchange capacity between different samples of the same soil type may be as large as variations between different soil series for soils of the same physical character. The exchange capacity of heavy soils is greater than that of light soils. Soils from arid regions have higher exchange capacities than soils of similar physical character from humid regions. The M. E. [milliequivalent] of bases combined with the exchange complex of 35 Texas soils averaged about 65 percent calcium, 15 percent magnesium, 4 percent potassium, 7 percent sodium, and 10 percent hydrogen. Many soils, however, contained no exchangeable hydrogen, as measured by the methods used. The nitrogen, phosphoric acid, potash, lime, alumina, and iron oxide, and basicity on an average increased regularly with increase in total exchange capacity up to 20 M. E. per 100 g, after which there was little relation of these constituents to the exchange capacity."

The influence of exchangeable sodium in the soil on its properties as a medium for plant growth, E. I. Ratner (*Soil Sci., 40 (1935), No. 6, pp. 459–471, pl. 1, figs. 4*).—The author finds such effects of exchangeable sodium upon the physical properties of soils as the retardation of the capillary rise of water, the decrease in permeability, and the increase in swelling and dispersability to be very marked, even when the exchangeable sodium constitutes only a few percent of the total exchangeable bases. The effect upon plant growth appeared only at higher concentrations, however.

"The influence of exchangeable sodium in chernozem soil on plant growth begins to be deleterious under the conditions imposed by pot tests only when it amounts to about 50 percent of the total exchangeable bases. Death of the plants (oats and wheat) occurs when the exchangeable sodium in the soil increases to 60 to 70 percent of the total exchangeable bases. The unfavorable influence of exchangeable Na upon the physical properties of soil, as well as its harmfulness to plant growth when there is a considerable quantity present in the soil, is more marked in soils rich in organic matter than in poorer soils.

"The destruction of plant life in pot experiments when there is a large amount of exchangeable Na is difficult to explain (in the case of noncarbonate soils) by the alkaline reaction of the medium, by the accumulation of soda, or by the unfavorable physical properties of the soil. One of the possible causes of the destruction of plant life may be assumed to be the breaking down in the soil of the calcium regime, and in particular an insufficiency of calcium as one of the elements of plant nutrition. . . .

"The chief object in the amelioration of noncarbonate solonetz should be the improvement of the physical properties of the soil, because its richness in exchangeable sodium, up to a certain very high limit, is not in itself a circumstance disturbing the normal development of plants."

The extent to which the erosibility of a soil can be anticipated by laboratory physical and chemical measurements, H. E. Middleton and C. S. Slater (*Amer. Soil Survey Assoc. Bul. 16 (1935), pp. 128–130*).—With respect to the possibility of calculating from available data a value approximately representative of the relative erosibility of a soil, the authors of this contribution from the Soil Erosion Service state, in part, that "the erosion ratio involves four separate laboratory determinations and may be written as the product of two other ratios.

$$\text{Erosion ratio}=100\times\frac{\text{suspension percentage}}{\text{total percentage silt and clay}}\times\frac{\text{moisture equivalent}}{\text{colloid percentage}}$$

where the term suspension percentage is the percentage of the soil (silt and clay) which remains suspended in water under standard conditions, total percentage of silt and clay is the amount of these materials found by mechanical analysis, moisture equivalent the usual determination at 1,000 gravity, and colloid percentage is the percentage of colloid determined by the moisture absorption method. Either of the contributing ratios of the erosion ratio may be considered as a partial measure of the erosibility of soils. The amount of silt and clay which readily remains suspended in water obviously measures an erosive tendency. In soils of fine texture this factor of the ratio is paramount. However, observation and opinion have indicated that the suspension percentage alone does not give a figure sufficiently high to represent the erosibility of sandy soils. Multiplication by $\frac{100}{\text{total percentage silt and clay}}$ was accepted as a purely arbitrary method of modifying the suspension percentage to agree with known erosibility. It is to be noted that this modification would have no effect on the ratio for a soil 100 percent silt and clay."

Moisture conservation in relation to erosion control under Red Plains conditions in the Southwest, H. G. Lewis (*Amer. Soil Survey Assoc. Bul. 16 (1935), pp. 124–126*).—A brief article from the U. S. D. A. Oklahoma Soil Erosion Experiment Station cites various observations supporting the opinion that in many cases "moisture is the limiting factor in crop production in the Red Plains region, and, as during the early spring and fall months there is a surplus amount of moisture, it behooves us to control this surplus so that there will be a plentiful supply of moisture in the soil during the hot, dry summer period. Incorporation of organic matter into the soil changes the structure and aids water-holding capacity. A good crop rotation, in conjunction with winter cover crops and leguminous crops, should be used which not only builds up the fertility of the soil but also helps check run-off and soil losses."

Soil erosion and soil ruin in South Dakota, J. G. Hutton (*Amer. Soil Survey Assoc. Bul. 16 (1935), p. 123*).—It is considered that the "rapid decrease of organic matter in the soil, due to continued cultivation and the return of little or no organic matter to the soil favoring decoherence of the particles in the soil granules", has been an important factor in producing soil conditions favorable for soil drifting. "The low assimilative coefficient of the soils of South Dakota, due to long cold winters when most microbiological processes are suspended, the dry seasons when there is not sufficient water to enable the bacteria of decomposition to function, and the very high surface temperatures during midday or midsummer", all contribute slowness of decomposition, so that even under natural conditions the accumulation of soil organic matter is slow. It is considered a conservative estimate that during the 50 yr. the soils have been under cultivation as much organic matter has disappeared as accumulated during the previous 5,000 yr.

"This long-time depletion of organic matter, together with the prolonged drought which destroyed or prevented the growth of a vegetative covering and made overgrazing a necessity, together with the fact that the moisture films on the soil particles have been so thin for many months, all have favored the movement of soil by the wind. Several violent windstorms, usually related to the wind-shift line of passing areas of low pressure, as on November 12, 1933, March 16, 1934, May 9, 1934, and several other notable gales, started soil moving so that more moderate winds could continue the process. These factors, together with the level topography of the terrain, have contributed to the serious soil condition in South Dakota."

Broad relationships between microörganisms and soil fertility, J. G. Lipman and R. L. Starkey (*New Jersey Stas. Bul. 595 (1935), pp. 32, figs. 3*).—This bulletin is largely a review of published work, including that in New Jersey and elsewhere and covering nearly 150 papers. The discussion takes up the scope of soil fertility, the influence of soil environment on microorganisms, and, under the general head of recent observations concerning soil micro-organisms, deals with nature of the soil population, environmental conditions, and interrelations between higher plants and micro-organisms.

Availability of nitrous nitrogen to plants, G. S. Fraps and A. J. Sterges (*Texas Sta. Bul. 515 (1935), pp. 27, figs. 2*).—Solutions of sodium nitrite applied to the roots of plants in pot tests were more toxic than corresponding solutions of sodium nitrate, but little toxicity was found when the sodium nitrite was distributed through the soil. The availability of the nitrous nitrogen in sodium nitrite was less than that of the nitric nitrogen in sodium nitrate. "In 11 comparisons with 0.1 g nitric nitrogen in 5,000 g of soil, 69.4 percent of nitric nitrogen was recovered as compared with 51.7 percent of the nitrous nitrogen. In 2 comparisons with 0.3 g nitrous nitrogen the availability was 50.8 percent as compared with 66.8 percent for nitric nitrogen. Small amounts of nitrous nitrogen were utilized just as well as nitric nitrogen, but larger amounts of nitrous nitrogen were not as well utilized. With 0.3 g in 5,000 g soil the nitrogen taken up from nitrous nitrogen was 76 percent of that of the nitric nitrogen, but the total plant growth produced by nitrous nitrogen was only 25 percent of that produced by the nitric nitrogen. . . .

"If the growth of the plants is taken as a measure of availability, the availability of the nitrite to corn, cotton, and oats at pH 6 was approximately 21 percent of that of nitrates. At pH 3.9–5.4, the average availability of the nitrite was 4, while at pH 6.4–7.7 it was approximately 112, compared with nitrates at 100. The comparative availability of nitrate and nitrites in water cultures depends upon the pH of the solution."

The place of nitrogen fertilizers in a pasture fertilization program, D. R. Dodd (*Jour. Amer. Soc. Agron., 27 (1935), No. 11, pp. 853–862, fig. 1*).—Six experiments, carried out at the Ohio Experiment Station and involving the use of nitrogen fertilizers on grass pasture, indicated that nitrogen fertilizer applied early in the spring increases the production not only in the early spring but throughout the season, as shown by regular and uniform mechanical harvests. "With different soil conditions or with limited mineral nutrients this might have been different", and the increased production during July and August "was so little that this could not be considered as a means of meeting the midsummer pasture shortage." Making a second or third application of nitrogen later in the season materially increased the fall growth. The exact time of response resulting from nitrogen treatments appeared to be dependent upon moisture and temperature conditions. Good growth was obtained in both July and August under favorable moisture conditions. Nitrogen was relatively less effective on sods carrying a high white clover content and in years of high white clover content. The percentage of white clover appeared to fluctuate from year to year, depending largely upon moisture and temperature conditions. Nitrogen applied to sods already well supplied with lime and phosphate produced feed at a much lower cost than that for which feeds of similar analysis could be purchased on the market.

"The law of diminishing returns from increased applications of nitrogen fertilizer appeared to operate at a much higher level than had been previously generally assumed. It appears that the rate of application of such fertilizer up to at least 60 lb. of nitrogen per acre should, in general practice, be determined largely by the amount of pasture required."

It was also found that "nitrogen-fertilized grass is more palatable and is grazed more closely than adjoining areas of grass which have had no nitrogen."

Commercial fertilizers in 1934–35, G. S. Fraps and S. E. Asbury (*Texas Sta. Bul. 517 (1935), pp. 43*).—The usual annual report on fertilizer analyses shows that in the 1934–35 season sales of fertilizers have increased about 24 percent over the last year, and that practically all the sales of mixed fertilizers were confined to about 20 analyses.

AGRICULTURAL BOTANY

A textbook of systematic botany, D. B. Swingle (*New York and London: McGraw-Hill Book Co., 1934, 2. ed., pp. XV+270, [pl. 1], figs. 76*).—This is an enlarged and partially rewritten edition (E. S. R., 59, p. 426), with many new illustrations.

A textbook of bacteriology, T. B. Rice (*Philadelphia and London: W. B. Saunders Co., 1936, pp. 551, figs. 121*).—The subject is dealt with in 58 chapters and 7 appendixes.

A text-book of mycology, E. A. Bessey (*Philadelphia: P. Blakiston's Son & Co., [1935], pp. XV+495, figs. 139*).—This book is intended as a textbook for first-year courses in mycology (presupposing a previous year in general botany), and was prepared especially to give the student in phytopathology a groundwork in the structure, life history, and classification of the more important groups of parasitic fungi, including the Mycetozoa and related forms. The physiological aspects are subordinated to the morphological, ontogenetical, and systematic features, and special emphasis is given to phylogeny. The final chapter, Guide to the Literature for the Identification of Fungi, comprises 75 pages. An index is provided.

The algae and their life relations: Fundamentals of phycology, J. E. Tilden (*Minnesota: Univ. Minn. Press, 1935, pp. XII+550, pl. [1], figs. 266*).—This volume was designed to offer to both teachers and students material arranged in orderly fashion, on the basis of which any desired course on algae might be planned. Terms are simplified and reduced in number, a series of life cycle diagrams is included, and the economic importance of various algal species is stressed.

The text appears under the following chapter headings: Some hypotheses concerning the phylogeny of the algae; the distribution of marine algae in time and space; a classification based on evolutionary development, with special reference to pigmentation and food reserves; five chapters dealing, respectively, with the classification of the Cyanophyceae, Rhodophyceae, Phaeophyceae, Chrysophyceae, and Chlorophyceae; the problem of algal control; algal food of animals; and marine algae, our richest source of vitamins—algae as food for man.

An appendix on the standardization of method of drawing algae for publication, a bibliography, and a subject index complete the work.

[Botanical studies by the Cornell Station] (*[New York] Cornell Sta. Rpt. 1935, pp. 86, 87, 92*).—Progress reports are given of studies on the relation of iron, manganese, and copper to the growth of green plants, by E. F. Hopkins; the influence of X-rays on ferns (*Polypodium*), by L. Knudson; the relation of certain nutrients to stomatal behavior, and the effects of transpiration on plants, both by O. F. Curtis; and biological radiations in the germination of mold spores, by O. Rahn and A. J. Ferguson.

[Botanical studies by the New York State Station] (*New York State Sta. Rpt. 1935, pp. 29, 38, 39*).—Brief reports are included on studies relating to the standardization of the nomenclature and classification of bacteria, and to the physiology of field crop, vegetable, and flower seed germination.

[Contributions on botany] (*Proc. 5. Pacific Sci. Cong., Canada, 1933, vol. 4 pp. 3153–3161, 3255–3266*).—Among papers of interest are the following:

Uses of Algae in Japan (for food, agar, glue, medicine, iodine, algin, manure, etc., with a list of species), by K. Okamura (pp. 3153–3161); Phytogeography of the Coniferae of Western North America, by W. L. Jepson (pp. 3255–3264); and Phytogeography of Conifers of Western South America, by C. Skottsberg (pp. 3265, 3266).

Cytological structures in Lilium, Allium, and Narcissus, H. R. C. McIlvaine (*Penn. Acad. Sci. Proc., 8 (1934), pp. 66–73, figs. 5*).—This is a contribution from the Pennsylvania State College.

Scientific observations and researches with citrus.—VII, The morphology of the thorns [trans. title], J. C. T. Uphof (*Gartenbauwissenschaft, 9 (1935), No. 4, pp. 219–230, figs. 10*).—The author presents the detailed results of a study of the thorns of a number of species, varieties, and hybrids of *Citrus*.

The anatomy and histology of the transition region of Tragopogon porrifolius, L. Havis (*Jour. Agr. Res. [U. S.], 51 (1935), No. 7, pp. 643–654, figs. 10*).—This study from the Ohio Experiment Station demonstrates the transition from root to stem structure in salsify to occur entirely in the hypocotyl. The transition region is largely tetrarch, two primary bundles, in addition to the two continuous with those of the root, being differentiated in the lower portion of this zone. Both the phloem and xylem in the two primary bundles of the root are continuous through the hypocotyl and into the midribs of the cotyledons. The two additional bundles arising in the basal portion of the transition region are located laterally and at right angles with respect to the cotyledonary ones. Further histological details are included.

Pollen grains: Their structure, identification, and significance in science and medicine, R. P. Wodehouse (*New York and London: McGraw-Hill Book*

Co., 1935, 1. ed., pp. XV+574, pls. 14, figs. 124).—This monographic volume is intended to present as far as possible what is known about pollen grains, primarily with the object of bringing out the principles involved in their study, of showing where new studies are needed, and of furnishing a reliable method of approach. Though the sections were for the most part written independently of one another, it was found that they would fit together in a sequence corresponding, in general, with the system of Engler and Prantl. The taxonomic significance of pollen morphology is stressed. The species were selected for study with special reference to those wishing to identify pollens found in the air and in fossilized peats and other sediments, and such insect-pollinated species as may be concerned in hay fever are also included. The materials on which the story of the morphology of pollen grains is based are presented in the specific and, to a certain extent, in the general descriptions. In discussing families the form of the grain basic for the group is described, and the interrelationships of the various forms to each other and the evolutionary tendencies manifest in the group are pointed out. Keys to many of the genera and species are provided. The illustrations are all original, and the greater part of both illustrations and text was prepared especially for this volume and appears here for the first time. Following the introduction, the subject matter is treated under the following chapter headings: Historical review; methods of collecting pollen in large amounts; preparation of pollen for microscopic examination; pollen statistics—a botanical and geological research method; atmospheric pollen; hay fever—early spring, early summer, late summer; pollen-grain characters; and classification, including a master key, fossil gymnosperms, living gymnosperms, with key to the genera, and angiosperms. A glossary, a bibliography, and an index conclude the volume.

Investigations on the root nodule bacteria of leguminous plants, XVI, XVII, A. I. Virtanen and S. von Hausen (*Jour. Agr. Sci. [England], 25 (1935), No. 2, pp. 278–296*).—Continuing this series (E. S. R., 69, p. 781), the following papers are presented:

XVI. *Effect of air content of the medium on the function of the nodule and on the excretion of nitrogen* (pp. 278–289).—The authors carried out experiments with sterile cultures of peas inoculated with their appropriate strain of nodule bacteria. In quartz sand the rate of excretion of nitrogenous compounds from the root nodules was directly proportional to the air supply to the roots. In water culture abundant nodules developed within the medium, but when they were all submerged the plants grew poorly and had a low nitrogen content. The greater the proportion of nodules above the fluid, the better was the plant growth. The submerged nodules were shown to be capable of fixing nitrogen, but in water culture their excretion of nitrogenous compounds was very slight or nil. Nodule formation was prevented when all the air in the medium was replaced by nitrogen gas. In agar culture, the greater the shrinking and cracking of the agar, the better was the plant growth and the number of nodules developing on the agar surface. Free access of air to the nodules also increased the rate of excretion of nitrogenous compounds. The agar cultures showed the latter to be due to actual excretion, since no wounding of the roots could take place there. Nitrogenous compounds were excreted from the growing nodules at a very early stage, and the rate was proportionally higher at the early stages. It is thus highly improbable that these nitrogenous compounds, as well as those taken up by the host plant, originate from the decomposition of the nodule proteins. It is believed that they represent the amino acids directly synthesised in nitrogen fixation.

XVII. *Efficiency of different strains of clover nodule bacteria* (pp. 290–296).—Using nitrogen-free quartz sand cultures of red clover, the efficiency of 10 strains of *Rhizobium trifolii* was studied over a 3-yr. period. During the first season distinct differences were noted in the size and nitrogen content of the crops after inoculation with the various strains. These differences remained clearly discernible over the 3-yr. period, showing that the strains had not materially changed. Reinoculation the third year with the most efficient strain did not affect the host plants originally inoculated with poorer strains. Winter losses of plants were greatest for those inoculated with the weak strains.

The occurrence of a strain of Azotobacter chroococcum which does not ferment mannitol, N. R. Smith (*Jour. Bact., 30 (1935), No. 3, pp. 323–328*).—This strain of *A. chroococcum*, here designated as a mannitol-negative strain, was isolated from various soils by substituting a carbohydrate (e. g., dextrin, starch, or sucrose) for mannitol in Ashby's agar. In certain soil samples from North Dakota, Utah, and Colorado this strain was the only *Azotobacter* present, while in other samples from the same States its numbers varied from 0 to 70 percent of the *Azotobacter* population. It was also found in varying proportions in soils from Nebraska, Texas, Delaware, Hawaii, Chile, and Greece, but not in soils from Washington, D. C., Jeanerette, La., Port Royal, Pa., and Turkey.

It is suggested that unless tests have shown the *Azotobacter* flora of a particular soil to be capable of utilizing mannitol, a carbohydrate should replace mannitol in Ashby's medium.

Mycorrhizae from Pymatuning Swamp, L. K. Henry (*Penn. Acad. Sci. Proc., 8 (1934), pp. 9–16*).—"Mycorrhizas were found in 19 out of 23 different trees and shrubs investigated from Pymatuning Swamp. There was no morphological difference between ectotrophic mycorrhizas collected from hemlocks and tulip trees growing in the bog or on the steep bank bordering the swamp. The majority of hosts were infected with the endotrophic type. The presence of ectrotrophic and endotrophic mycorrhizas in bog plants indicated their ability to grow under swamp conditions. *Rhus vernix* was the only new host plant from this region. Soil type cannot be a limiting factor, since mycorrhizas have been found in four different soil habitats, namely, bog peat, forest humus, clay loam, and sand."

Mycorrhizal habit in the genus Citrus, M. C. Rayner (*Nature [London], 136 (1935), No. 3439, pp. 516, 517*).—The observations and published works of the author and others prompt her to urge the need for expert diagnosis of root condition with respect to mycorrhizal equipment as an index of favorable or unfavorable soil environment and as a guide to efficient manurial treatments of crops having regular mycorrhizal associations.

Critical studies of comparative plasmolytic and cryoscopic determinations of osmotic values in plants [trans. title], A. Buhmann (*Protoplasma, 23 (1935), No. 4, pp. 579–612, figs. 13*).—The author describes the methods used and details the results obtained in comparative tests on a wide variety of plants.

Effect of pressure of atmosphere on development of red clover, P. W. Wilson (*Nature [London], 136 (1935), No. 3433, pp. 262, 263*).—Red clover plants grown in sand cultures under pressures of from 0.12 to 1.8 atmospheres made relatively good growth over the whole range. However, at pressures less than atmospheric and greater than 0.2 atm. a definite stimulation of development occurred, while at pressures less than 0.2 atm. there was usually some inhibition of growth, probably due to low oxygen pressures. Abnormal growths occasionally occurred under the low pressures.

The photochemical reaction in photosynthesis, R. Emerson and W. Arnold (*Jour. Gen. Physiol., 16 (1932), No. 2, pp. 191–205, figs. 4*).—"Measurements of photosynthesis were made in continuous and flashing light of high intensity, using cells varying in chlorophyll content. The amount of chlorophyll present per molecule of carbon dioxide reduced per single flash of light was found to be about 2,480 molecules. The length of time required for one unit in the photosynthetic mechanism to complete the cycle of photochemical and Blackman reactions was found to be about 0.02 sec. at 25° C. The equation $R=AIN$ was shown to give a good description of the rate of the photochemical reaction when A is a velocity constant, I the intensity of light, and N the number of units in the photosynthetic mechanism."

Experimental researches on vegetable assimilation and respiration.—XXI, Induction phases in photosynthesis and their bearing on the mechanism of the process, G. E. Briggs (*Roy. Soc. [London], Proc., Ser. B, 113 (1933), No. B 780, pp. 1–41, figs. 6*).—A great many investigations have been centered on the rate of photosynthesis when it has reached a stationary value, but very little attention has been paid to transitions from one stationary state to another consequent on a change in the intensity of one of the determining factors. The transition here considered is that taking place when chlorophyll-containing cells (in this case moss plants) pass from darkness to illumination.

With regard to the method of attack, the relation between the ratio of the rate of assimilation in the early stages of the induction phase to the final rate and the intensity of illumination and temperature was used in a preliminary survey to ascertain the type of schema required. This having been decided, the author formulated the schema more precisely, and tested whether it would account not only for the relation of the ratio to illumination and temperature but also for the quantitative changes which the ratio undergoes with advances in the induction phase. Finally, he arrived at a schema which gave a good quantitative account of his own facts and those recorded by others and which agreed with the other known facts of photosynthesis. From this he concluded that either his schema approximates to a true picture of the mechanism involved, or that the correct explanation has a mathematical formulation which, for the range of conditions studied, approximates closely to that of the actual data. The schema presented will be confirmed or modified as new facts accumulate, and in the meantime it is believed that it will suggest new lines of attack. The mathematical details of the formulas given are discussed in detail, and the author's results are compared with those of various investigators.

Photosynthesis in intermittent light, in relation to current formulations of the principles of the photosynthetic mechanism, G. E. Briggs (*Biol. Rev. Cambridge Phil. Soc., 10 (1935), No. 4, pp. 460–482, figs. 4*).—From data here reported, the author claims to "have shown that the effect of such factors as concentration of chlorophyll, concentration of carbon dioxide, intensity of illumination, and poisons on the rate of photosynthesis in continuous illumination can be interpreted on the basis of a mechanism of photosynthesis suggested in an earlier paper [see above]. Other suggested mechanisms are shown to be inadequate.

"The results of the recent experiments of Emerson and Arnold [see above] with flashing light have been shown to be in harmony with the schema, but further experiments are necessary before the full significance of the results can be ascertained."

The nitrogen nutrition of plants [trans. title], A. I. Virtanen (*Ann. Acad. Sci. Fennicae, Ser. A, 36 (1933), [No. 12], pp. 1–27, figs. 8*).—This is a lecture summarizing recent work by the author and his coworkers.

The influence of certain substances on the nitrogen content of seeds of legumes during germination (influence of added sugars), VII [trans. title], N. Vita and R. Sandrinelli (*Gior. Biol. Indus., Agr. ed Aliment., 5 (1935), No. 2, pp. 41–51, figs. 4*).—A study of the action of glucose and sucrose on nitrogen fixation in pea and lupine seeds during germination indicated that even when the sugars did not of themselves have any action on this function they altered the effects of other stimulants added at the same time.

It was also found that in May and June nitrogen fixation in pea seeds occurs spontaneously during germination in the presence of distilled water alone. This is contrary to what occurs during the other months of the year, and it is therefore concluded that the phenomenon is seasonal.

The relation between chlorophyll content and rate of photosynthesis, W. E. Fleischer (*Jour. Gen. Physiol., 18 (1935), No. 4, pp. 573–597, figs. 13*).—"Data are presented which support the conclusion of Emerson [E. S. R., 64, p. 327] that the rate of photosynthesis is proportional to the chlorophyll content when the latter is varied by varying the iron supply. These data give a straight line passing through the origin, which is not true of Emerson's results. Similar data are presented which show that a similar relation exists when nitrogen controls the chlorophyll content. Evidence is given which indicates that magnesium plays a part in the process of photosynthesis in addition to its effect upon the chlorophyll content."

The action of mechanical factors on the formation and development of the flowers and their significance in the fruitfulness of plants [trans. title], H. Härdtl (*Gartenbauwissenschaft, 9 (1935), No. 4, pp. 246–268, figs. 2*).—An increase in the mechanical requirements in artificially weighted plants of *Syringa vulgaris* and *Valeriana officinalis* proved a hindrance to blossom formation. Frequently the blossoming period was delayed, and normal growth was not attained during the growing period. Vegetative growth and fruit and seed production were noticeably decreased. Practical applications of the data to fruit trees are suggested.—(*Courtesy Biol. Abs.*)

Plant pigments and reproduction, R. H. Roberts and N. Livingston (*Science, 82 (1935), No. 2138, p. 596*).—The data presented in this contribution from the University of Wisconsin failed to indicate any correlation between the carotinoid pigments and fruitfulness.

The sugars of assimilating leaves [trans. title], W. L. Kretowitsch (*Hoppe-Seyler's Ztschr. Physiol. Chem., 231 (1935), No. 6, pp. 265–270*).—In actively assimilating leaves at about 10 a. m. on sunny days directly reducing sugar predominated over crystalline polysaccharides, particularly over the crystalline fructoside. More fructose than glucose was found in the leaves studied, namely, *Betula alba, Tilia europaea, Populus* sp., *Convallaria majalis, Aspidium filix mas,* and *Dahlia variabilis.* Small amounts of sugar and carbohydrate were found which were difficult to hydrolyze, could not be precipitated by lead acetate, and were not soluble in 82 percent alcohol, but which were soluble in water.

The resins: The botanical and chemical bases of our knowledge concerning the formation, development, and composition of the plant excretions, rev. by A. Tschirch and E. Stock (*Die Harze: Die botanischen und chemischen Grundlagen unserer Kenntnisse über die Bildung, die Entwicklung und die Zusammensetzung der pflanzlichen Exkrete. Berlin: Borntraeger Bros., 1935, 3. ed., rev., vol. 2, pt. 1, pp. XII+471, figs. 103*).—This volume (B, Special Part) of the monograph series (E. S. R., 71, p. 583) treats of the resin esters (the gum benzoin group and the group of resins of the Persian-Afghanistan Umbelliferae) and the resene resins (gum and true resins of the Burseraceae, Anacardiaceae, and Dipterocarpaceae).

Analyses of the substances exosmosing from plant organs [trans. title], J. Babička (*Bot. Centbl., Beihefte, 52 (1934), Abt. A, No. 3, pp. 485–506, figs. 4*).—After the shoot tips and roots had been removed, the axes of young *Lupinus albus, Vicia faba, Avena sativa,* and *Aesculus hippocastanum* were immersed in distilled water, and analyses of the exosmosing substances were made after ½ hr. The same was done on twigs of *Tradescantia zebrina* and *Salix viminalis*. Qualitative analyses were made by usual methods and quantitative ones by the dripping mercury cathode. More substances exosmosed from the apical than from the basal end—from the apical end, substances reducing the Fehling solution, albuminous substances, and phosphate and potassium salts, and from the basal end, fewer of the above substances and more of those inorganic in character. Substances exosmosing from the apical ends were more basic and those from the basal more acid. Substances exosmosing from the apical end did not withstand electroreduction (mercury cathode method) in the presence of dilute electrolytes, such as LiCl and NH_4Cl. This could not (or only to a silght degree) be determined for those substances exosmosing from the basal end.—(*Courtesy Biol. Abs.*)

The growth-promoting substances [trans. title], J. Babička (*Bot. Centbl., Beihefte, 52 (1934), Abt. A, No. 3, pp. 449–484*).—This is a review of present knowledge on plant hormones, the following divisions of subject matter being made: The terminology of growth substances, their occurrence and behavior, the mechanism of their distribution, their relation to tropisms, the growth substances formed by bacteria, and the chemistry of growth substances. Ten pages of bibliography are included.

A physiological analysis of the growth substance, A. J. H. Smit and F. W. Went (*K. Akad. Wetensch. Amsterdam, Proc., 38 (1935), No. 8, pp. 852–857*).—A number of organic substances were tested for hormone activity by the pea test, cylinder test, and *Avena* test, as measured by elongation, and their polar transport properties were determined. Certain substances were found to have growth-stimulating properties without showing polar transport. They did not act in the *Avena* bending test nor produce bud inhibition. Allocinnamic acid was found to have very high cell elongation capacity, but the steric isomer cinnamic acid had no activity.

The integration of plant behaviour.—V, Growth substance and traumatic curvature of the root, F. Keeble and M. G. Nelson (*Roy. Soc. [London], Proc., Ser. B, 117 (1935), No. B 803, pp. 92–119*).—The authors draw the following conclusions from this investigation:

"Negative and positive traumatic curvature may be interpreted in terms of growth substance and the gradient of concentration of growth substance on opposite sides of a wounded root. Inasmuch as they are the direct consequences of the asymmetry of distribution of growth substance brought about by the wound and not a response to a specific stimulus, traumatic curvatures are not to be regarded as tropistic. Growth substance occurs in the root of *Zea mays* and must be regarded as a normal secretion of the tip. The wound substance which appears on the surface of a wounded root tip is in the first instance and mainly an exudation of that preformed in the intact root. The receptor for the stimulus of gravity appears to extend from the tip through the vegetative apex (formative region) into a part at least, if not the whole, of the elongating region. The secretion of growth substance is localised. It is most active in the extreme tip, falls off rapidly (in *Z. mays*) in the first millimeter zone, and less rapidly in the second millimeter zone, beyond which little, if any, secretion occurs. Negative traumatic curvature is a harmonious curvature of the root as a whole, due to the wound preventing growth substance from reaching the side of the elongating region above the wound. Positive curvature is a tip curvature, i. e., one confined to the part of the root in front of (apical to) the wound. It is due to the wound preventing the escape of growth substance and thereby bringing about an increase in concentration in the part of the root apical to and on the same side as the wound. Growth and curvature bear no quantitative relation to one another.

the one being related to the concentration of growth substance in the growing region, the other to the gradient of concentration between its opposite sides."

Activation of cambial growth by pure hormones, R. Snow (*New Phytol., 34 (1935), No. 5, pp. 347–360, figs. 5*).—"Cambial growth was activated in decapitated stems or hypocotyls of young sunflower seedlings by applying to their upper ends solutions in gelatine of pure synthetic heteroauxin and of pure auxin-*a*, at concentrations of 1 in 10^6 and 2 in 10^6, respectively. The cambium formed was in the normal position and of the normal kind. In one experiment the effect of the hormone (auxin-*a*) extended for at least 30 mm below the region to which it was applied.

"The results are discussed, and it is concluded that normally cambial growth is activated by the same growth hormone which, formed by the young leaves, promotes extension of cells in stems. This hormone may actually be auxin-*a*."

Effects of ethylene on plant growth hormone, H. D. Michener (*Science, 82 (1935), No. 2136, pp. 551, 552*).—The author states that in none of his experiments, here briefly described, could ethylene have acted in the same manner as a growth hormone. It therefore appears probable that all the effects of ethylene on growth are to be explained not as direct effects of ethylene alone but as its effects on a growth hormone.

The morels of Pennsylvania, L. O. Overholts (*Penn. Acad. Sci. Proc., 8 (1934), pp. 108–114, figs. 8*).—This contribution from the Pennsylvania Experiment Station includes descriptions and notes on five species of *Morchella*, with a key for their identification.

Plant material introduced by the Division of Plant Exploration and Introduction, Bureau of Plant Industry, October 1 to December 31, 1933 (*U. S. Dept. Agr., Inventory 117 (1936), pp. 14*).—This number consists of 212 lots of plant material introduced for testing in the United States. In many cases descriptive notes are included.

The Chicago soil-nutrient-temperature tank, G. K. K. Link (*Science, 81 (1935), No. 2095, pp. 204–207, fig. 1*).—The Chicago soil nutrient temperature tank combines the advantages of the Wisconsin soil temperature tank with those of nutritional studies by continuous drip or discontinuous methods of applying nutrients and other ingredients to sand or soil substrates of plants. The essential change consists in the substitution of six 8-l glazed earthenware percolator urns provided with drain tubes through the sides of the tank for the eight small, undrained, metal containers of the Wisconsin tank. The change avoids the direct pathogenic effects of deficient soil aeration, metal ions, and sharply restricted root development, as well as their indirect pathogenic effects in disposing plants to other deleterious influences. The tank has been put to the following uses: The study of the relation of environal factors to the processes, structures, and behavior of fruit trees; the production and cure of iron excess and deficiency in apple trees; and the study of the relation of carbohydrate-nitrogen nutrition (1) of apple trees to infection by *Erwinia amylovora*, (2) of tomato plants to infection by *Fusarium lycopersici*, (3) of cabbages to infection by *F. conglutinans*, and (4) of flax to wound healing and regeneration.—(*Courtesy Biol. Abs.*)

A germinator for root work, M. A. Raines (*Science, 83 (1936), No. 2140, p. 20, fig. 1*).—The apparatus described consists essentially of an oversized bucket with an annular water trough built into the outside of its rim and with a cover over all. The seeds are germinated on vertical strips of absorbent paper, the upper ends of which dip into the water in the trough. Thus the roots develop in a saturated atmosphere, with a minimum of mechanical disturbance and with easy access at all times.

Electro-ultra-filtration apparatus, E. J. Czarnetzky (*Science, 82 (1935), No. 2139, pp. 625, 626, fig. 1*).—The essential feature in the chemical ultrafilter here described lies in the fact that the thimble is kept from clogging by means of the repulsion between the negatively charged protein and the cathode.

Regulating the flow of solution for plant cultures, S. F. Trelease and J. R. Thomson (*Science, 81 (1935) No. 2095, p. 204, fig. 1*).—This note calls attention to the simple and efficient method of Shive and Stahl (E. S. R., 60, p. 424), and describes a modification permitting considerable latitude in regulating the rate of flow.

Note on a micro-colorimeter and its possible application, J. de Zeeuw and D. J. Kuenen (*Protoplasma, 23 (1935), No. 4, pp. 626–629, figs. 2*).—The authors describe a microcolorimetric procedure, based on the well-known plasmolytic method of Höfler, for determinations of the osmotic concentrations in colored cells independently of their shape or of the type of plasmolysis. The concentrations of the pigment before and after plasmolysis are all that is required to determine the volume concentration of the vacuole, provided there have been no chemical changes in the cell sap during the process.

New arrangement for regulating flow of liquid into a culture vessel, C. Zinzadze (*Science, 81 (1935), No. 2109, pp. 540–542, fig. 1*).—From a comparative study of different arrangements, the author has developed a new form of continuous-flow apparatus, which is here described. The rate of flow of a liquid through a small orifice is determined partly by the viscosity of the moving liquid within the orifice, partly by the hydrostatic-pressure difference between the entrance and exit of the orifice, and partly by the resistance introduced by the orifice walls. A Mariotte flask alone suffices to maintain a practically constant hydrostatic head excepting that pressure at the entrance to the orifice is somewhat excessive when the temperature of the confined air in the reservoir is rising. In the author's apparatus this source of fluctuation is practically avoided without a constant-level tank by the use of a new annular orifice which is readily adjustable for different degrees of resistance without interrupting the liquid flow, and which is not so apt to become clogged as are other orifices.

A method of passing air, gas, or vapor over or through micro-organismal growths, J. W. Williams (*Science, 82 (1935), No. 2125, p. 284, fig. 1*).—The author describes an inexpensive, adjustable, and adaptable apparatus easily made from stock laboratory materials for use in studying toxic and stimulative effects of gases or vapors on colonies of micro-organisms in either liquid or solid media.

Notes on Belling's green-light method for critical microscopy, H. C. Waterman (*Stain Technol., 10 (1935), No. 3, pp. 97–100, figs. 2*).—This installment (E. S. R., 71, p. 177) includes notes 3 to 6.

(3) *On the use of the term "stenochromatic" to distinguish and define the transmission of certain filters.*—Noting that the green filters most useful in microscopy transmit a single and rather narrow band of wave lengths, the author distinguishes such transmission both from true monochromatic illumination and from the light transmitted by dichroic filters and by filters which either cut off no part of the visible spectrum completely or cut off only small portions at one or both ends by the use of the term stenochromatic ("narrow-colored"). It is defined as the transmission of a band of wave lengths not wider than the average width of one spectrum "color" or not more than about 70 mμ of wave length.

(4) *A "stenochromatic" blue-green light filter of value in microscopy.*—The Wratten light filter films Nos. 47 and 61 mounted together transmit a stenochromatic band approximately 490 (500, 2.3 percent) 520 mμ. With a light of

sufficient intensity (see following abstract), definition and resolution are thus distinctly improved.

(5) *A rapid and optically satisfactory method of mounting gelatin film light filters.*—Permanent mounts can be made by mounting either single films or two together between pieces of thin plate glass in cedarwood immersion oil. The method is described.

(6) *The front-silvered substage mirror in a better and more permanent form.*—A commercially available form of front-silvered mirror, in which the silver is protected by a very thin film of lacquer, is noted as being more permanent and better silvered than that made (as suggested in note 2 of this series) by dissolving off the backing paint from pieces of common silvered mirror. A reflecting prism gives the same result, except for a slightly greater loss of light. The construction of a holder for the mirror is described and figured.

A microscope lamp especially designed for the Belling method, H. C. WATERMAN (*Stain Technol., 10 (1935), No. 4, pp. 113–126, figs. 2*).—The author used a common 32, 32 c. p. automobile headlight bulb, Mazda No. 1000, the special possibilities depending on the two filaments, which can be operated either singly or together and are so small and close together that they form a concentrated source even when both are used, and on the special adaptability of the bulb for overloading.

Within the range of from 6 to 8 v per filament for which the bulb is made, the two filaments when run together yield a maximum of about 160 c. p., while the 32 c. p. of single filament at its design voltage provides a reduction of one-fifth of the maximum without reducing the color temperature below that required for "daylight" filters. The higher intensities permit the use of very dense green filters, and the bulb is small enough to allow a very effective reflector. Relatively little heat is developed, and ordinary small transformers provide the voltage range.

The lamp described conforms to the requirements of the Belling method but includes some new means for putting these principles into practice. The principles and simplified constructional details are fully described and illustrated.

Illuminator for critical microscopy utilizing automobile headlight lamps, F. M. UBER (*Science, 82 (1935), No. 2139, pp. 624, 625, fig. 1*).—A small light source (3 mm) of both uniform and high intensity was obtained by the use of a fine ground glass as a secondary source, on which was focussed the light from a 6- to 8-v automobile lamp. Adaptations of such lamps to use with commercial microscope illuminators and with both high- and low-power fields are described.

Histological applications of tannic acid and ferric chloride, H. T. NORTHEN (*Stain Technol., 11 (1936), No. 1, pp. 23, 24*).—By using tannic acid and ferric chloride in conjunction with a cytoplasmic, cellulose-wall stain and with a nuclear, lignin stain, clear preparations of stems of various ages of pear, elderberry (*Sambucus* sp.), and water-hyacinth (*Eichhornia* sp.) were obtained. Detailed procedures are given.

Lacto-phenol preparations, W. E. MANEVAL (*Stain Technol., 11 (1936), No. 1, pp. 9–11*).—More or less permanent mounts of fungi, algae, root tips, epidermis, germinating spores, etc., may be made readily by transferring the objects to the Amann lactophenol containing aniline blue, W. S., or acid fuchsin, used singly or mixed. Detailed procedures and formulas for mounting media and for 10 stains are given.

A bath for orienting objects in paraffin, M. N. POPE (*Science, 82 (1935), No. 2128, p. 356, fig. 1*).—A copper embedding bath is described, which is kept warm, during orientation of objects in the paper trays of melted paraffin placed thereon, by hot water run in from a reservoir. After orientation the hot water is drawn off and ice water immediately introduced. A binocular microscope may be used with the apparatus.

GENETICS

Genetic variations in relation to evolution, H. S. Jennings (*Princeton, N. J.: Princeton Univ. Press; London: Oxford Univ. Press, 1935, pp.* [*VII*]+*138*+[*1*], *figs. 21*).—This book deals with genetic variations and their relationships to evolution. A considerable portion of the work is concerned with variations and mutations in unicellular organisms.

Heredity, mainly human, E. Moore (*London: Chapman & Hall, 1934, pp. VII+343, pls. 11, figs. 8*).—This book deals with the principles of genetics. Special emphasis is placed, in the latter portion of the book, on the inheritance of human traits.

Mathematical treatment of the results of agricultural and other experiments, M. J. Van Uven (*Groningen: P. Noordhoff, 1935, pp. VI+310, figs.* [*9*]).—A presentation of the fundamentals of statistical methods in their application to the analyses of variance, as observed in the results of agricultural experiments dealing especially with fertilizers, soils, and crop production.

Statistical methods as applied to economics, business, education, social and physical sciences, etc., H. Arkin and R. R. Colton (*New York: Barnes & Noble,* [*1935*], *rev., pp.* [*12*]+*228*+*47, figs. 36*).—A text explaining the customary methods employed in statistical analyses of data, and including tables for the squares of numbers up to 1,000, square roots of numbers up to 100,000, and cubes and cube roots of numbers up to 450.

The beginnings of plant hybridization, C. Zirkle (*Philadelphia: Univ. Penn. Press; London: Oxford Univ. Press, 1935, pp. XIII+231, pls.* [*8*]).—This contribution to botanical history from the Morris Arboretum of the University of Pennsylvania considers in successive chapters the earliest descriptions of hybrids, degeneration and the delayed discovery of plant hybrids, xenia in *Zea mays*, plant hybridization before Koelreuter, and a résumé of later hybridization. The book also includes a chronological list of hybridization, 1716–60; a bibliography; and an index.

Plant chimaeras and graft hybrids, W. N. Jones (*London: Methuen & Co. 1934, pp. VIII+136, figs. 21*).—Much of the material in this volume formed the subject matter of a course of intercollegiate lectures to advanced students of botany in the University of London. In it the author attempts to cover the subject matter as exemplified in a wide variety of plant species, with interpretations of the observed phenomena.

Intergeneric hybrids of Triticum and Secale with Haynaldia villosa, W. J. Sando (*Jour. Agr. Res.* [*U. S.*], *51* (*1935*), *No. 9, pp. 759–800, pls. 14, figs. 9*).—*H. villosa* was crossed on *T. aegilopoides*, *T. timopheevi*, *T. dicoccoides*, *T. dicoccum*, *T. durum*, *T. polonicum*, *T. turgidum*, and *S. fragile*, and the F_1 plants were matured. Attempts to cross *H. villosa* with *T. vulgare*, *T. compactum*, *T. spelta*, *S. cereale*, and *S. cereale ancestrale* produced only an occasional enlarged structure with neither embryo nor endosperm. One hybrid seed of *T. vulgare* (C. I. 6223)×*H. villosa* germinated, but the plant died before the third leaf formed.

All F_1 plants were completely self-sterile except those of *T. turgidum* var. Alaska×*H. villosa*. In that cross the F_1, F_2, and F_3 plants produced respective average seed sets of 3.8, 29.7, and 58.5 percent, with maxima of 11.1, 58.8, and 76.9 percent for single plants. No apparent segregation occurred in F_2 and subsequent generations. The F_1 type remained fixed in its morphological characters.

In general, most F_1 hybrids resulting from crossing *Triticum* spp. and *S. fragile* with *H. villosa* resembled the *Triticum* or *Secale* parent, but a critical study of the morphological characters possessed by the parents and F_1 hybrids indicated that most of the characters of the hybrids are intermediate between those of the parents. Certain characters of the F_1 plants showed, however, a decided increase in degree of expression over those of either parent, while others showed a dominance of the one or the other parent.

More than 52 morphological characters of the parents and the F_1 hybrids of eight crosses were studied in detail.

Yield and composition of eared and earless maize plants in a selfed line segregating barren stalks, R. J. Garber, R. B. Dustman, and C. R. Burnham (*Jour. Amer. Soc. Agron., 28 (1936), No. 2, pp. 85–91, fig. 1*).—The weights and composition of plants and plant parts of normally eared and earless individuals in the same selfed strain of Boone County White corn were studied at the West Virginia Experiment Station. Earless behaved as a monohybrid recessive. Stems and leaves of earless plants weighed more and contained a higher percentage of sugars than did those of the eared plants. As to entire plants, eared individuals weighed significantly more and contained higher percentages of total carbohydrates and of ether extract and a somewhat lower percentage of crude protein than the earless individuals.

Random sampling and the distribution of phenotypes on ears of backcrossed maize, G. F. Sprague (*Jour. Agr. Res. [U. S.], 51 (1935), No. 8, pp. 751–758, figs. 4*).—The distribution of groups of 1, 2, 3, etc., kernels of the yellow-white (*Y y*) and starchy-sugary phenotypes (*Su su*) was studied on 81 backcrossed ears of corn. The data as originally collected were found not to be random. A bias operated to increase the number of groups with one kernel per group and to reduce the number having three or more. Missing kernels and length of kernel row were found to be the chief sources of this bias. When corrections were made for these disturbances, the distributions were well in accord with expectancy.

Lethal factors in cattle [trans. title], E. L. Larsson (*Lantbr. Veck. Handl., 1935, pp. 310–331, figs. 10*).—A summary of lethal factors which have been observed in cattle is given.

A sex-linked lethal gene in the Single Comb White Leghorn fowl, C. W. Upp and N. F. Waters (*Poultry Sci., 14 (1935), No. 6, pp. 372, 379*).—Data are presented on the sex ratio of the progeny of certain White Leghorn sires and their sons at the Iowa Experiment Station to suggest that several of them transmitted a sex-linked, recessive lethal gene.

Statistical studies on the inheritance of sexual maturity in White Leghorns and Rhode Island Reds, A. B. Godfrey and M. A. Jull (*Poultry Sci., 14 (1935), No. 6, pp. 346–350*).—A study of the mean age of sexual maturity among 2,179 White Leghorn and 1,689 Rhode Island Red pullets, produced over a period of seven years at the U. S. D. A. Beltsville Research Center, showed a significant correlation (z=0.161 and 0.483, respectively) with the age at sexual maturity of their dams. Correlations between age at sexual maturity of the daughters and the age at sexual maturity of their maternal granddams were also significant for Rhode Island Reds, but not for White Leghorns. Daughter and paternal granddam correlations were not significant in either breed. It is pointed out that the variability of full sisters was significantly less than the variability between half sisters or more distantly related birds. Both sires and dams differed significantly in their ability to transmit early sexual maturity to their progeny, although White Leghorns were relatively more homozygous in this respect than Rhode Island Reds.

A study of factors influencing chromosomal segregation in translocations of Drosophila melanogaster, H. B. Glass (*Missouri Sta. Res. Bul. 231 (1935), pp. 28, figs. 2*).—Studies of segregation occurring in cases of mutual translocations in chromosomes 2 and 3 at different points in *Drosophila melanogaster* are reported. The results obtained in an amedial heteroaxial and a monomedial equiaxial type of translocation led to the following general hypothesis of segregation in rings of four:

(1) Segregation in general is determined by the forces exerted between homologous loci. (2) Segregation in a 4-chromosome ring tends to take place along a single predetermined axis so as to result in the equal numerical division of the chromosomes. (3) Segregation along a given axis is proportional to its relative paired length. (4) Except for the determination of the axis, the distribution of the chromosomes tends to be at random. (5) A reduction of competitive pairing on the part of two of the four chromosomes in the ring leads to less random segregation. (6) The relation of crossing-over to disjunction is of a secondary nature.

[Studies of the physiology of reproduction in ruminants] (*[New York] Cornell Sta. Rpt. 1935, p. 77*).—Experiments are noted by S. A. Asdell and G. H. Ellis in which injections were made of massive doses of Progynon B into sterile cows, and by Asdell and H. J. Brooks (E. S. R., 72, p. 756) in which the normal lactation of a goat, following a lactation in which the milk yield was improved by prolactin injections, was shortened.

On the conditions necessary for the continuous growth of hypophysectomized animals, H. M. Evans, R. I. Pencharz, and M. E. Simpson (*Endocrinology, 19 (1935), No. 5, pp. 509–514, figs. 3*).—Failure to stimulate growth in hypophysectomized dogs and rats by the administration of purified extracts of the hypophysis was rectified by the use of an aqueous alkaline extract of the beef anterior hypophysis at the California Experiment Station.

Hypophysectomy of the goat, R. T. Hill, C. W. Turner, A. W. Uren, and E. T. Gomez (*Missouri Sta. Res. Bul. 230 (1935), pp. 18, figs. 7*).—A method is described for removing the pituitary from goats. The pituitary is approached by an incision slightly to one side of the midline in the throat, and the gland is exposed through an oval hole driven through the sphenoid bone. The pituitary and surrounding rete mirabile are coagulated with an electrical high frequency cautery and the gland removed in a charred condition.

The operation causes a decline of from 50 to 75 percent in milk production in lactating goats for 1 or 2 days following the operation, but milk flow soon returns to the previous level.

FIELD CROPS

Principles and practice of field experimentation, J. Wishart and H. G. Sanders (*London: Empire Cotton Growing Corp., 1935, pp. 100, figs. 2*).—Part 1 of this publication deals with statistical principles underlying modern field experimentation, and part 2 with problems arising when the principles are put into practice. Developed from an article by Engledow and Yule (E. S. R., 56, p. 431), the present work incorporates improvements in method and practice brought about during the last decade.

The value of preliminary uniformity trials in increasing the precision of field experiments, R. Summerby (*Macdonald Col., McGill Univ., Tech. Bul. 15 (1934), pp. 64, figs. 2*).—Each of four ranges of land approximately 0.75 acre in area was divided into plats 20 by 20 links and cropped uniformly for 10 to 12 consecutive years. Assuming five different platting plans involving two sizes of plats, analysis of variance was calculated for each range each year. The relative precision of error variances was determined for single plats and for enough replications to take up the same area. With the same platting plans, analysis of co-variance of assumed preliminary tests and subsequent trials on corresponding plats was made for consecutive yearly yields, for yearly yields several years apart, and for the average of a period of years and subsequent yearly yields.

Out of 134 correlation coefficients, 77 reached the level of significance as measured by P=0.05. When yearly yields of trial years were adjusted for the regression on their preliminary yields, there often was an improvement in precision but it seldom was great. Conclusions were that the use of preliminary uniformity trials for the purpose of adjusting yields of subsequent experiments by regression is only rarely as effective in increasing the precision of an experiment as is the use of the same amount of land and labor in the year of the trial.

A simple method of head threshing, F. H. Peto (*Sci. Agr., 15 (1935), No. 12, pp. 825, 826, fig. 1*).—A simple device for threshing single spikes or panicles of cereals and grasses is described.

[Agronomic research in Arkansas], M. Nelson, R. P. Bartholomew, C. K. McClelland, L. C. Kapp, C. R. Adair, and O. A. Pope (*Arkansas Sta. Bul. 323 (1935), pp. 8–18, 19–22, 24–29, figs. 4*).—Brief reports of progress are made from experiments with field crops (E. S. R., 72, p. 756) at the station and substations, including variety trials with cotton, corn, wheat, winter and spring oats, rye, barley, rice, grain sorghum, sorgo for sirup, soybeans and cowpeas for seed and hay, peanuts, vetch, and crotalaria; breeding work with cotton and rice; genetic studies with cotton; fertilizer trials with cotton and rice; relation of soil type to cotton yields; winter hardiness experiments with oats; cultural including planting tests with corn and oats; effects of cutting and fertilizer treatments on duration of alfalfa stands; trials of mung beans for hay and seed; interplanting of legumes in corn and effects on yields of the succeeding crop of cotton; control of rice weeds; rice yields following corn, cotton, and soybeans; residual effect of fertilizer on preceding crops of rice; cover crops for rice; cotton fiber investigations including analysis of variance of halo length in cotton, studies on samples satisfactory for single fiber strength tests, length-diameter relationship of cotton fiber, and fiber analyses from wilt variety, wilt-fertilizer, and variety and strain tests; efficiency of single and double restriction in randomized field trials with cotton; and pasture studies. The cotton fertilizer studies dealt with formulas for different sections, rates of application, placement, home v. factory mixed, and nitrogen carriers.

[Field crops and plant breeding research], H. H. Love, F. P. Bussell, W. T. Craig, R. G. Wiggans, C. H. Myers, O. Smith, and G. C. Moore (*[New York] Cornell Sta. Rpt. 1935, pp. 108, 109, 110, 111, 112, 144, 145*).—Brief reports of progress (E. S. R., 72, p. 758) are given from breeding work with silage corn, wheat, oats, barley, alfalfa, and soybeans; genetic studies with wheat-rye crosses; and potato experiments including fertilizer, soil reaction, cultural, and storage studies. A number of the activities were in cooperation with the U. S. Department of Agriculture.

The differential influence of certain vegetative covers on deep subsoil moisture, H. E. Myers (*Jour. Amer. Soc. Agron., 28 (1936), No. 2, pp. 106–114, figs. 3*).—This study of the influence of different legumes and nonlegumes on subsoil moisture, made at the Kansas Experiment Station, supplements earlier work by Duley (E. S. R., 61, p. 519) and somewhat similar studies by Kiesselbach et al. (E. S. R., 71, p. 765).

Sweetclover grown continuously on soil for two seasons under the conditions of this experiment reduced the subsoil moisture in certain cases to a maximum depth of 14 ft. Indications were that a reduction approaching the minimum point of exhaustion had extended into the thirteenth foot section. One year's growth of sweetclover in certain cases reduced the moisture to near the minimum point of exhaustion to a maximum depth of 9 ft. Soybeans growing for one season did not result in the development of a dry layer below the sixth foot in any plat included in the study. The depth of moisture reduction by alfalfa and sweetclover was governed largely by the rainfall during the period when the legume occupied the soil. It is pointed out that growth of sweetclover for either one or two years under limited rainfall conditions may result in the development of a dry layer of depth sufficient to prevent the utilization of moisture at a lower level by subsequent alfalfa crops.

Relation of fallow to restoration of subsoil moisture in an old alfalfa field and subsequent depletion after reseeding, C. O. Grandfield and W. H. Metzger (*Jour. Amer. Soc. Agron., 28 (1936), No. 2, pp. 115–123, figs. 4*).—That alfalfa cropping had depleted the soil of available moisture to a depth of nearly 25 ft. was determined in experiments at the Kansas Experiment Station. Clean fallow restored available subsoil moisture to a depth of 25 ft. in about 2 yr., and a subsequent seeding of alfalfa again depleted this moisture in about the same length of time. Conclusions were that 2 yr. of fallow were necessary to restore subsoil moisture on old alfalfa ground to a point where the roots of a newly seeded crop could pentrate through moist soil to a depth of 25 ft. or deeper. Two years after seeding alfalfa the subsoil was depleted of moisture to a point near the wilting coefficient, making it necessary for the crop to depend on current rainfall unless the root penetration had been deep enough to reach moisture at lower depths.

A botanical study of pasture mixtures, W. C. Stone and J. R. Fryer (*Sci. Agr., 15 (1935), No. 12, pp. 777–805, pls. 4; Fr. abs. p. 805*).—Botanical studies were made, 1931–34, on six pasture mixtures, including biennial and perennial species, as sown in 1931 at the University of Alberta. The better seed mixtures for perennial pastures contained alfalfa, brome grass, and Kentucky bluegrass, species characterized by productiveness and palatability, amicable growth association, and by strong endurance to drought, cold, and defoliation. The poorer, short-duration mixtures contained sweetclover and white clover but no alfalfa. White clover had disappeared almost completely at the beginning of the third season after seeding, believed due mainly to shading and crowding effects of brome grass and sweetclover. Altaswede red clover decreased less than alsike clover, but these two clovers and slender and crested wheatgrasses all showed rapid decreases in frequency and were not considered entirely satisfactory for pasture. Timothy was not injured by drought and repeated defoliation, yet it appeared more suitable for hay and pasture as indicated by rank culm growth and tendency to head production. Sweetclover was of value in mixture only up to the middle of the second summer because of its biennial growth habit and the dry conditions in the latter part of this season. Its objectionable features for pasture were coarseness and short life. Weeds were kept well in check and usually appeared to be decreasing in frequency.

Factors affecting the chemical composition of pasture grasses, D. W. Edwards and R. A. Goff (*Hawaii Sta. Bul. 76 (1935), pp. 31, figs. 6*).—The relative effect of location, species, and season on the chemical composition of grasses was studied in different sections on the Parker Ranch, Island of Hawaii. Rhodes grass (*Chloris gayana*), tall fescue (*Festuca elatior*), paspalum (*Paspalum dilatatum*), phalaris (*Phalaris tuberosa*), and kikuyu grass (*Pennisetum clandestinum*) were planted in each of four locations. Samples for chemical analysis were taken at bimonthly intervals for 14 mo. The effect of location, species, and season on the protein, calcium, and phosphorus content of the grasses was determined by the "pairing" method of statistical analysis.

Location appeared to have a strong influence on the absorption of phosphorus and calcium, their contents in the best section being 3 and 1.7 times, respectively, those in the poorest section. The average protein percentages of all grasses were similar for the four locations. The lowest percentages of phosphorus occurred in the dry, leeward section, yet lack of moisture did not appear to be the primary cause. Low calcium and phosphorus in the forage was found in the wet, windward section.

Composition varied with species, the effect being the greatest with protein. The calcium percentage appeared to bear an inverse relationship to protein in the five grasses, while phosphorus bore no definite relationship. The specific relationships found between the five species should be considered as true only for the experimental conditions. Season produced a distinct trend in all three constituents, with highest values during the cool winter months. Protein varied directly with calcium as well as phosphorus throughout the season. Differences in chemical composition of grasses from the four sections could not be correlated with actual pasture management. Records showed that the section with the lowest phosphorus content gave no evidence of mineral deficiency.

Influence of soil and variety on the copper content of grains, J. E. Greaves and A. Anderson (*Jour. Nutr., 11 (1936), No. 2, pp. 111–118*).—Wheat, oats, and barley, together with the corresponding soils from different parts of Utah, were analyzed for copper at the Utah Experiment Station. The wheat varied from 5.6 to 16.7 p. p. m. copper, averaging 8.8; the barley from 6.2 to 11.9 p. p. m., averaging 7.8; and the oats from 6.4 to 9.8 p. p. m., averaging 7.4. Corresponding soils carried from 3.9 to 50.9 p. p. m., averaging 17.1. The copper content of the grain invariably was lower than that of the soil until the copper content of the soil was below 6 p. p. m. No correlation was found between the copper content of the grain and the soil on which it was grown.

Sixteen wheat varieties grown on the same soil and under similar conditions varied in copper content from 5.6 in Kofod × Turkey to 16.7 p. p. m. in Montana 36, averaging 9.7. It appeared probable that variety is the main factor in determining the copper content of Utah-grown wheats, but improbable from the limited data presented that copper is a limiting factor in plant or animal nutrition, insofar as Utah is concerned.

Influence of the carbohydrate-nitrogen relation on nodule production by red clover, C. E. Georgi (*Jour. Agr. Res.* [*U. S.*], *51* (*1935*), *No. 7, pp. 597–612, figs. 7*).—The inhibitional effects of combined nitrogen upon nodule production by inoculated red clover plants, according to results obtained at the Wisconsin Experiment Station, can be overcome partly by increasing the carbohydrate synthesis in the plant, i. e., by supplying inoculated plants given combined nitrogen with additional carbon dioxide. Coincident with overcoming this inhibition there was found to occur a rise in concentration of the soluble carbohydrate in the sap, and decreases in the percentage of nitrogen (widening of C:N relation) and in the concentration of combined inorganic nitrogen in the sap.

These responses are discussed with reference to their bearing on the theory that the inhibitional effects of combined nitrogen depend on the influence of the latter on available carbohydrate.

Intracapsulary bolls in Asiatic cotton, R. E. Beckett (*Jour. Agr. Res.* [*U. S.*], *51* (*1935*), *No. 9, pp. 839–845, figs. 2*).—Supernumerary carpels were observed in various degrees of development in a large proportion of the bolls of a strain of *Gossypium herbaceum* from Tashkent, U. S. S. R. In certain bolls the growth was developed to the extent of forming small intracapsulary bolls containing from one to three mature seeds covered with lint of fair quality. These intracapsulary bolls resembled closely the bolls containing them in appearance, color, and shape, and as viewed from outside appeared to be divided into two to four carpels, although the placentae were not developed enough to form separate carpels. This abnormal boll growth seemed to be hereditary but of such a nature that its expression is influenced largely by environment. Environmental effects were shown by the increase in the percentage of bolls containing supernumerary carpels and in the development of intracapsulary bolls as the season advanced.

A comparison of winter legume green manure and nitrate of soda for fertilizing cotton, G. A. Hale (*Jour. Amer. Soc. Agron., 28 (1936), No. 2, pp. 156–159*).—Winter legume green manure, sodium nitrate, and a combination of green manure and sodium nitrate were compared for fertilizing cotton during 8 yr. on Cecil sandy loam at the Georgia Experiment Station.

Green manure of hairy vetch and Austrian winter peas turned under 2 weeks before planting cotton resulted in slightly larger yields than 100 lb. per acre of sodium nitrate applied at planting. Average yields of seed cotton resulting from 200 lb. per acre of sodium nitrate amounted to 1,154 lb. v. 1,044 lb. from winter legume green manure. Supplementing the green manure with 100 and 200 lb. of sodium nitrate per acre increased yields over green manure alone. Slightly better stands, as shown by total number of plants and hills per acre at picking, were observed on the green manure and sodium nitrate alone treatments than where both were used.

A compilation of experimental data on cotton fertilizers applicable to the hill sections of Mississippi, compiled by C. F. Clark (*Mississippi Sta. Bul. 309 (1935), pp. [2]+49*).—Information compiled from reports of experiments and studies with fertilizers for cotton, made by State experiment stations and the U. S. Department of Agriculture and held applicable to the hill sections of Mississippi, covers amounts of nitrogen, phosphorus, and potash to apply per acre; low analysis v. high analysis fertilizer; factory-mixed v. home-mixed fertilizer; sources of nitrogen, phosphorus, and potash for cotton; organic v. inorganic nitrogen sources; and time of applying sodium nitrate to cotton.

The "seeds" of the genus Poa commonly found on the market in Canada, W. H. Wright (*Sci. Agr., 15 (1935), No. 12, pp. 811–813, pls. 4*).—Characteristics of *Poa* spp. of commercial importance in Canada—Kentucky bluegrass (*P. pratensis*), Canada bluegrass (*P. compressa*), rough-stalked meadow grass (*P. trivialis*), and wood meadow grass (*P. nemoralis*), and also of the annual bluegrass (*P. annua*)—are described and illustrated for the seed analyst.

Basal sets vs. apical sets of seed potatoes (*New York State Sta. Rpt. 1935, p. 36*).—A comparison of relative yields is noted.

The conservation of plant nutrients by the use of rye as a cover crop, H. H. Hill (*Va. Fruit, 24 (1936), No. 1, pp. 108–112*).—This note from the Virginia Experiment Station is a semipopular account of experiments on cover crops in the orchard, which indicated that not only did rye serve to conserve plant nutrients but that also an appreciable amount of water was held by this crop.

Effect of soybeans on corn yields, H. B. Brown (*Louisiana Sta. Bul. 265 (1935), pp. 31, figs. 6*).—The effects of soybeans on corn production in central and southern Louisiana when the two crops were planted in the same row at the same time, planted in alternate rows and in the same rows with soybeans planted at different rates, and the merits of soybeans for soil renovation when plowed under or cut for hay, were studied 1929–34. The tests were made under rather humid conditions on moderately fertile soil with vigorous, rank-growing varieties of corn and soybeans.

Soybeans planted in the corn row at corn planting invariably made good growth and averaged 3,108 lb. of dry hay per acre. They lowered the corn grain yield 19.1 percent the first year, and 33.6 the second, but increased it 12.7 the third, 51.7 the fourth, and 35.2 percent the fifth year. Soybeans decreased the weight of corn stover the first years of the experiment, but increased it in the later years. Soybeans grown in corn for 4 yr. increased the organic matter content of the soil 0.176 percent, and the total nitrogen 0.0088 percent. Cotton on land growing corn and soybeans for 5 yr. made much more vigorous growth and better yields than cotton after corn alone. It is deemed more economical to grow the two crops on the same land than on separate areas. Corn and soybeans grown separately averaged per acre 20 bu. of corn and 3,069 lb. of dry soybean hay, and in combination 33.9 bu. of corn and 4,020 lb. of hay.

With the same number of stalks per acre, both corn and soybean yields differed little between alternate-row and every-row planting. Under favorable conditions for corn, every-row planting appeared to give best results, while with unfavorable conditions the alternate-row method seemed preferable. Harvesting also is facilitated by alternate-row planting. Seeding rates of soybeans 10, 15, and 20 lb. per acre in corn did not result in consistent differences in corn grain or stover yields, but a higher rate increased the yield of soybean hay.

Turning under soybeans grown alone increased corn yields the next year by 55.6 percent, 162.3 at the end of the second rotation, and 98.1 percent at the end of the third. Plats where soybeans were grown alone and cut for hay returned an increase in corn yields the next year of 22.9 percent; an increase of 74.3 percent in the fourth year, the end of the second rotation, and of 83.9 percent at the end of the third rotation. The relative values of soybeans, cowpeas, velvet beans, and mung beans for planting in corn are discussed.

Earliness of sexual reproduction in wheat as influenced by temperature and light in relation to growth phases, H. H. McKinney and W. J. Sando (*Jour. Agr. Res.* [*U. S.*], *51* (*1935*), *No. 7, pp. 621–641, figs. 5*).—Studies of the influence of temperature and the photoperiod in relation to growth phases, earliness of sexual reproduction, and seasonal growth habit of the common wheat plant are reported, with data on the effects of two types of electric light used to prolong the natural day in relation to time of sexual reproduction and seed production.

"Spring wheats such as Marquis and earlier varieties complete their life cycle quickly when given a long day and temperatures at 70° F. or above throughout the life cycle, and therefore are considered to be typical long-day high-temperature plants. On the other hand, Harvest Queen, Turkey, and other varieties of winter wheat complete their life cycle most rapidly when given a short day and low temperatures during the early stages of growth and a long day and high temperatures during the later stages of development."

Conclusions were that the spring wheats studied are long-day high-temperature plants, whereas the winter wheats studied are not typical long-day plants but are what may be termed short-day → long-day plants and low-temperature → high-temperature plants. This method of expression indicates that the temperature and the length of the photoperiod must increase with the development of the plant in order to induce the earliest possible sexual reproduction. Temperatures and photoperiods favoring earliness in the winter and spring wheats favor the formation of a reduced number of internodes and leaves by each tiller. Formation of the stem internodes and leaves stops and the major elongation of the stem begins at about the time that floral differentiation becomes evident.

When used to prolong the natural winter photoperiod, the Mazda C tungsten lamp induced higher seed yields and later maturity than the Cooper-Hewitt mercury-arc lead-glass-tube lamp.

Irrigation experiments with wheat, A. T. Bartel and C. Hobart (*Arizona Sta. Bul. 151* (*1935*), *pp. 355–388, figs. 14*).—Experiments involving 10 irrigation treatments were conducted in cooperation with the U. S. Department of Agriculture with Baart wheat at the Salt River Valley Experiment Farm at Mesa, where, because of mild winters, spring wheat is planted in December or January. Two treatments totaled 12 in. of water each, seven 18 in., and one treatment 27 in., variously applied before and after planting, in the tillering, jointing, heading, and soft- and hard-dough stages.

The stand was reduced greatly by irrigation as soon as the wheat was planted. Irrigation at the tillering stage was not economical from the viewpoint of soil moisture. Plants receiving no irrigation between tillering and heading usually lodged very severely when the irrigation at heading was applied, apparently due to poor crown-root development.

The irrigation procedure before heading resulted in more tillers per plant where the applications of water were small, a higher percentage of head-producing tillers and more heads per plant where the total amount of water applied before heading was small, and more heads per unit area of land as the total water applied before heading decreased. The last three characters correlated very highly with grain yields. Single applications exceeding 3 in. before heading caused the plants to assume an unhealthy yellow appearance, probably due to leaching of nitrates into the subsoil and to insufficient soil aeration.

Applications of but 3 in. of water at the heading and soft-dough stages did not keep the moisture above the wilting coefficient in the third foot of soil. Six-inch applications are recommended at these two stages. Irrigation at the hard-dough stage is not advised because it leaves some soil moisture above the wilting coefficient when the plants reach maturity.

The average weight of 100 kernels at maturity rose with the total irrigation after jointing until a total of 15 in. of water had been applied. The highest yields of grain and straw were obtained from use of 3 in. of water before planting, 3 at jointing, 6 at heading, and 6 in. at the soft-dough stage. This treatment was most satisfactory in producing plant characters correlated with yield, and also supplied enough moisture after heading to insure good, large, plump kernels.

HORTICULTURE

[Horticultural studies by the Arkansas Station] (*Arkansas Sta. Bul. 323* (*1935*), *pp. 39–41*).—Briefly discussed are studies of the relation of nutrients to the vascular anatomy of tomato seedling hypocotyls, by V. M. Watts; factors influencing the uneven maturity of grapes, by J. R. Cooper and C. B. Wiggans; the effect of varying pH values on the metabolism and general performance of strawberries and vegetables and the fertilizer needs of vegetables, both by Cooper and Watts; fertilizer requirements of the peach, by Cooper and Wiggans; cover crops for orchards and pruning of apples, both by Cooper; variety tests of tomatoes and plant characters in relation to variety, both by Watts; and the disbudding of fruit trees, by Wiggans.

[Olericultural studies by the Cornell Station] (*[New York] Cornell Sta. Rpt. 1935, pp. 109, 110, 111, 112, 138–144*).—Brief reports are presented on studies dealing with the genetics of cabbage and breeding of cabbage, both by C. H. Myers; breeding of celery, by R. A. Emerson; premature seeding of onions, by H. C. Thompson and O. Smith; relation of temperature to type of growth in lettuce, by Thompson and J. E. Knott; onion fertilization, color and thickness of onion scales, and strains of lettuce, all by Knott; pungency in onions, by H. Platenius and Knott; effect of environmental factors on growth and color of carrots, by Thompson and W. C. Barnes; fruit setting in peppers, tomatoes, and eggplant, by Thompson, Smith, and H. L. Cochran; land utilization for vegetable crops, by F. O. Underwood and Barnes; soil reaction for vegetable crops and green manures and cover crops, both by P. H. Wessels; and the handling and storage of vegetables, by Knott, Platenius, and J. D. Hartman.

[Vegetable studies by the New York State Station] (*New York State Sta. Rpt. 1935, pp. 81–84*).—Studies reported are the placement of fertilizers with relation to the row; time of applying fertilizer; residual effect of row fertilization on the succeeding crop of canning peas; different kinds and amounts of fertilizer; breeding of tomatoes; and varieties of muskmelons and of garden peas for quick freezing.

Agricultural research relating to canning crops (*Washington, D. C.: Natl. Canners Assoc., 1936, pp. 124*).—This is a review of work in progress and publications issued since 1932, supplemented by suggestions as to future work.

Variability in measurements of height and width of market garden plants, D. R. Willard and J. B. Smith (*Jour. Amer. Soc. Agron., 27 (1935), No. 10, pp. 798, 799*).—An analysis by the Rhode Island Experiment Station of measurements taken upon vegetables included in a fertilizer experiment showed that records on cabbage and celery improved in uniformity as the plants increased in size. This was also true to a lesser degree for beets. The products of height by width were less uniform than either dimension alone, suggesting a tendency for tall plants to be also wide. Measurements were most uniform for tomato vines and least for celery. The authors state that if a 10 percent difference is considered significant, probable errors of 3 percent should be allowable. Grouping the plants measured in three categories, this average accuracy for the season could have been approximated by 10 measurements of height or width for spinach and tomatoes, 15 measurements for beets and cabbage, and 20 measurements for celery.

Influence of temperature and moisture on the viability of some vegetable seeds, A. V. San Pedro (*Philippine Agr., 24 (1936), No. 8, pp. 649–658*).—Studies with various species of vegetables showed little or no effect of differential storage temperatures on viability of seed if they were stored over calcium chloride. Without the drying agent, storage temperature had little effect on bean, eggplant, or tomato seeds during the first 162 days but did have a definite influence on lettuce and pechay seeds. After 312 days there was an increased deterioration correlated with higher temperatures in bean, eggplant, lettuce, pechay, and tomato seeds. In bean seed held at 0°, 10°, 20° to 22°, and 27.5° to 28° C. the germinations after 312 days were 82, 40, 5, and 5 percent, respectively. On the whole moisture was more detrimental to seeds in storage than temperature increases. From a practical standpoint the author recommends that in storing vegetable seeds moisture should be removed with calcium chloride or the seed should be dried and stored in hermetically sealed containers. Where seed cannot be dried thoroughly they should be stored at a temperature as near zero as possible.

Effect of harvesting, spacing, and age of plants on yields of asparagus, E. S. HABER (*Iowa Sta. Bul. 339 (1935), pp. 16, figs. 4*).—Six years' records taken on a planting of Mary Washington asparagus set in 1927 and first cut in 1929 showed that long-continued cutting in the early summer is detrimental. Cutting until July 15 shortened materially the profitable life of the plantation by reducing the diameter and weight of spears after five harvests to an unprofitable point. Cutting until July 1 was profitable all 6 yr., but indications pointed to a loss in weight and diameter of spears. Cutting to June 15 proved more profitable than either earlier or later dates, particularly when the initial cutting was deferred until the third season after planting.

With reference to spacing, either 2 or 3 ft. in the row and 5 ft. between rows appeared most desirable, as measured by the size and total yield of spears. The setting of 1-yr. plants in the permanent bed gave better results than direct seeding. There was little difference between 1- and 2-year-old plants, with the indications favoring the younger stock. Three-year-old plants produced a poor stand and a poor product.

Celery fertilizer experiments in Ohio, D. COMIN (*Ohio Sta. Bimo. Bul. 178 (1936), pp. 13–18*).—Continuing investigations (E. S. R., 66, p. 432), the fertilizer application on one-half of each plat was increased and certain changes made in the ratio of mixtures used. The results show a substantial increase from all treatments and supplements, and especially from the heaviest application, 2,000 lb. per acre of a 2–8–16 mixture. The increase from this over the 1,500-lb. application was significant. The data point to the usefulness for celery on new muck soil of all three fertilizer elements, namely, N, P, and K. There were noted seasonal variations in the effect of different treatments. Fine responses secured from 8 tons of stable manure per acre are considered noteworthy, especially on the highly organic soil such as utilized. The delayed application of part of the K was without benefit, indicating that K does not leach in muck soils.

[Pomological studies by the Cornell Station] (*[New York] Cornell Sta. Rpt. 1935, pp. 123–127*).—Among studies, the progress of which is briefly discussed, are those dealing with orchard soil utilization, by J. Oskamp; storage of cherries at freezing temperatures, by D. B. Carrick; pollination of the apple, by L. H. MacDaniels; dressings for tree wounds, by McDaniels and D. S. Welch; winter injury to fruit trees, by MacDaniels and E. R. Wagner; pruning of apple trees, by A. J. Heinicke and MacDaniels; fertilizing of apple orchards, alfalfa and other legumes as a source of nitrogen in the orchard, and inducing early fruiting in apple trees, all by Heinicke; and the photosynthetic activity of apple leaves under natural conditions, by Heinicke, M. B. Hoffman, J. G. Waugh, and N. F. Childers.

[Pomological studies by the New York State Station] (*New York State Sta. Rpt. 1935, pp. 44, 54, 55, 62–80*).—Included are brief reports on studies of spray removal from various crops, notably currants and apples; varieties of raspberries, strawberries, apples, pears, peaches, cherries, plums, and grapes; pruning and bud selection in the apple; cracking of sweet cherry fruits; xenia and polyploidy in apples; association of chromosomal number with size of apple stomata; cucumber breeding; fertilizer tests with apples and cherries in the Hudson River Valley; fertilizer, pruning, and rootstock requirements of grapes at Fredonia; breeding of grapes; cold resistance of grapes; control of leafhopper in grapes; handling of dormant nursery stock; stock and scion relations in the apple; vegetative propagation of rootstocks; promising new rootstocks; emergency rootstock propagation methods; germination of fruit tree seeds; developmental morphology of fruits; artificial culture of fruit tree embryos; winter injury to the Baldwin apple; fertilizer needs of apples and sour cherries; cover crops for orchards; relation of soil type and soil temperature to tree growth in lysimeters; and the propagation and improvement of the hop plant.

Fruit breeding farm report, 1935, W. H. Alderman and F. E. Haralson (*Minn. Hort., 64 (1936), No. 1, pp. 5, 8*).—This is a brief progress report upon general activities and upon new fruits that are about to be named and disseminated for trial.

Packing Minnesota fruits for market, J. D. Winter, W. H. Alderman, and W. C. Waite (*Minnesota Sta. Bul. 323 (1935), pp. 18, figs. 7*).—Herein are presented the results of a study of different types of fruit packages, with particular reference to their adaptability for marketing Minnesota fruits. The bushel basket, said to be almost universally used in Minnesota for marketing apples, is conceded a desirable package, and the use of ring packing forms for facing baskets is recommended for the higher grades of apples. Minnesota plums, on the other hand, are being marketed in various types of containers, with no apparent trend toward standardization. The Hallock type of berry box made of wood veneer, uniformly identified with home-grown Minnesota strawberries, is believed satisfactory under present conditions. Tests of paperboard berry boxes showed no advantages and some disadvantages as compared with the wood-veneer packages. Ventilated crates were found to be rapidly replacing the old-style nonventilated crates for shipping raspberries, causing lesser spoilage. In the vicinity of the Twin Cities the 24-qt. crate is used by strawberry growers for the spring crop, but in other sections of the State the 16-qt. crate is often used. The fall strawberry crop is handled in both quarts and pints, with the latter gaining favor.

Storage experiments with boxed raspberries and strawberries protected with transparent wraps showed no material influence on keeping. Some suggestion is given that such coverings might be useful in protecting berries designed for shipment, but whether their use is economically practical or not is questioned.

The formation of ethylene by plant tissues and its significance in the ripening of fruits, R. Gane (*Jour. Pomol. and Hort. Sci., 13 (1935), No. 4, pp. 351–358*).—Evidence is presented that the gaseous substance generated by ripe apples and capable of producing epinastic effects on the petioles and leaves of growing plants is identical with ethylene. The active substance from apples was completely removed by combustion and by reaction with bromine, ozone, fuming nitric acid, and fuming sulfuric acid. The reaction with bromine yielded an oil which was identified as ethylene dibromide by the formation of biphenyl ethylenediamine with aniline. The abnormal growth of seedlings was not produced in low concentrations of simple esters identical with or similar to those produced by ripe apples.

Apple rootstock studies: Effect of layered stocks upon the vigour and cropping of certain scions, R. G. Hatton (*Jour. Pomol. and Hort. Sci., 13 (1935), No. 4, pp. 293–350, pls. 3, figs. 3*).—In presenting a further report (E. S. R., 64, p. 539) upon studies in which four varieties of apple, Lane Prince Albert, Bramley Seedling, Worcester Pearmain, and Cox Orange Pippin, were worked on several different clonal rootstocks and carefully compared as to stock and scion effects, the author reports that the majority of the stocks, namely, East Malling Nos. VIII, IX, IV, VII, X, XII, and XVI, appear to exert relatively the same influence on all varieties. In Nos. I, II, V, and VI there was noted definite scion partialities both in vigor and to some extent in production. Scions on very vigorous rootstocks were found to be four and five times as heavy as those on very dwarfing roots, and the ratio of branches to trunk varied with different stocks. The kind of rootstock had a profound influence upon the beginning of fruiting in the scion variety and also on total yield. At the end of 16 yr. trees on some rootstocks had borne from two to three times the weight of fruit harvested from others. On No. IX rootstock trees of one variety had produced 7.5 times their own weight in fruit, whereas on No. XII the tree and fruit weights were approximately equal.

Practical sanitation for apple orchards, M. D. Farrar, S. C. Chandler H. W. Anderson, and V. W. Kelley (*Illinois Sta. Circ. 443 (1936), pp. 24, figs. 9*).—Stating that the bark of trees and debris lying about the orchard harbor overwintering codling moth larvae, the authors present information on the scraping of trees, pruning of old wood, cleaning up of orchards and packing houses, use of chemically treated bands, and other measures designed to reduce the insect population. Suggestions are also given on the control of borers, San Jose scale, tree hoppers, grasshoppers, apple flea weevils, rodents, and various diseases, such as scab, bitter rot, fire blight, and blister canker.

Varietal suitability of peaches for preserve making and factors affecting the quality of the product, H. H. Moon, C. W. Culpepper, and J. S. Caldwell (*U. S. Dept. Agr. Circ. 375 (1935), pp. 1–16, 19, 20, 21*).—Preserves made from a total of 67 varieties of peaches, 40 of the melting dessert, 20 of the clingstone canning, and the others of intermediate type, were graded carefully for consistency, color, degree of disintegration, texture, and flavor. As a group the nonmelting-fleshed varieties made preserves having clearer, more attractive color, distinctly less disintegration of the fruit, and less distinctive and pronounced flavor than did the melting-dessert varieties. These differences were associated with the much greater solution of cell walls and formation of soluble pectin in the melting-fleshed varieties. Considerable differences were noted within each group in their suitability for preserving. Even in varieties of closely related groups, such as the Crawford and Elberta types, there were observed marked differences in color, texture, consistency, and flavor of the product, indicating that the individual varietal characters determine suitability for preserving.

When the boiling was carried to a uniform end point of 107° C., there were only insignificant differences in final yield, and these were apparently associated with water content. In all varieties there was a progressive improvement in color and flavor of the product with advancing maturity, indicating that the best stage for harvesting is one in which the fruit is as ripe as can be prepared and cooked without too much disintegration.

An instrumental device, which measures the depth to which a weighted cone sinks into the product (E. S. R., 73, p. 411), was employed successfully for measuring consistency of the product.

Additional data are noted on page 875 of this issue.

Preservation of the Young and Lucretia varieties of dewberries by freezing, J. M. Lutz, R. C. Wright, and J. S. Caldwell (*Fruit Prod. Jour. and Amer. Vinegar Indus., 13 (1934), No. 9, pp. 267–269, 281, fig. 1*).—In studies conducted by the U. S. Department of Agriculture Youngberries frozen in hermetically sealed enameled tin cans or in liquid-tight paraffin containers kept excellently when packed in 45° or 50° sirup. Packing in dry sugar was slightly inferior, and packing without sugar or sirup was still less desirable. Temperatures as high as 0° to 10° F. were successfully employed in freezing the fruit, and temperatures as high as 10° to 15° kept the fruits satisfactorily. Promising results were secured with frozen Youngberries in manufacturing ice cream.

Lucretia dewberries frozen at 17° in 50° sirup in either airtight or nonairtight containers yielded a very desirable dessert product. Fruits packed without sirup or sugar were decidedly inferior to the sirup pack in flavor and appearance.

Flower behavior of avocado varieties, F. G. Galang and E. K. Morada (*Philippine Jour. Agr., 6 (1935), No. 3, pp. 231–269, figs. 3*).—Observations during two flowering seasons on a large number of named and unnamed varieties showed that the flowers, with the exception of one tree, had two distinct periods of opening and closing, with the stigmas receptive during the first and the pollen shed during the second period. The length of time for opening of the flowers, dehiscence of pollen, and receptiveness of the stigma varied with the variety and with the weather. Although considerable setting of fruit occurred on isolated trees of certain varieties due to the continuance of receptiveness of the stigmas into the second period, production was less than where cross-pollination was provided or overlapping of the opening periods occurred. Avocado varieties may be grouped into those which open their flowers first in the morning and those which open first in the afternoon.

Studies of leaf and flower buds showed the latter to be rounded, with the scales and transition leaves developing more slowly than the leaf buds. On heavy-fruiting trees practically all twigs flowered, but the terminal panicles were generally the most vigorous. Defoliation occurred during the flowering season to a degree related to the number of flowers produced.

Coffee cultural practices in the Kona District of Hawaii, J. C. Ripperton, Y. B. Goto, and R. K. Pahau (*Hawaii Sta. Bul. 75 (1935), pp. 64, figs. 25*).—For the most part this bulletin consists of useful information on such considerations as soil and climatic requirements, manner of growth of the coffee tree, the planning and planting of coffee orchards, propagation, pruning, rejuvenation, shading, culture, fertilization, nature and control of the die back disease, and cost of production. A description is presented of the physiological features of the Kona District, a favorable coffee-producing area.

The results of coffee fertilizer experiments presented in graphic form show the striking value of potash. Without an adequate supply of this element there was excessive die-back and almost a total lack of production of new wood. Trees receiving complete fertilizer or N plus K were green and vigorous and bore heavy crops. K applied with N counterbalanced the harmful effects of excessive applications of the latter element. Data are presented on the amount of N, P, and K in entire coffee cherries, the pulp, parchment skin, and bean.

[Floricultural studies by the Cornell Station] (*[New York] Cornell Sta. Rpt. 1935, pp. 103–105*).—Included are brief reports of studies of doubleness in stocks, by R. C. Allen; photoperiodism in miscellaneous annuals, effect of temperature and day length on euphorbia, effect of nitrate-nitrogen concentration of the soil on the vegetative growth and flower production of sweet peas, and effects of varying temperatures on some greenhouse plants, all by K. Post; chlorosis of roses, by E. A. White and J. C. Ratsek; fertilizers for mature elm trees, by D. Wyman, L. H. MacDaniels, and E. L. Worthen; and application of ammonium sulfate to lawns, by Wyman.

The gladiolus, 1936 (*Boston: New England Gladiolus Soc. Inc., 1936, pp. IX+182, pls. 33*).—This yearbook of the New England Gladiolus Society contains information on varieties, culture, hybridizing, etc.

Rhododendrons and azaleas: Their origins, cultivation, and development, C. G. Bowers (*New York: Macmillan Co., 1936, pp. XIV+549, pls. 40, figs. 159*).—This is a comprehensive treatise on natural distribution, botany, culture, propagation, hybridization, etc.

FORESTRY

[Forestry studies by the Arkansas Station], L. M. Turner (*Arkansas Sta. Bul. 323 (1935), pp. 42–44*).—Among studies reported are those dealing with the sowing, watering, and fertilizing of shortleaf and loblolly pine seedlings; root growth of shortleaf and loblolly pine seedlings; rate of growth of black locust, catalpa, and Osage-orange as affected by the 1934 drought; and the adaptation of species to soil types and soil phases.

[Forestry investigations by the Cornell Station], J. N. Spaeth (*[New York] Cornell Sta. Rpt. 1935, pp. 106, 107*).—Reports are presented upon improved practices in the germination of basswood and paper birch seeds, the production of black ash planting stock, and the relative damage by rodents to basswood, red oak, and white ash plantations.

A comparison of two virgin forests in northwestern Pennsylvania, H. F. Morey (*Ecology, 17 (1936), No. 1, pp. 43–55, figs. 2*).—Studies by the Allegheny Forest Experiment Station in two areas representing small remnants of the once extensive Pennsylvania white pine forests showed considerable differences in the present composition, despite the fact that the forests are located only 20 miles apart and have very similar climates. There were 93 herbaceous shrub and tree species common to both areas. One area had a lower percentage of white pine, fewer trees per acre, and smaller basal area per acre. Although key species of the *Pinus-Tsuga* and *Quercus-Castanea* associations were found in both forests, there was evidence that the establishment of the white pine, oak, and chestnut is now checked and that these species are being replaced by hemlock and members of the *Acer-Fagus* association.

A climax forest community on East Tionesta Creek in northwestern Pennsylvania, A. F. Hough (*Ecology, 17 (1936), No. 1, pp. 9–28, figs. 5*).—Studies by the Allegheny Forest Experiment Station on plats established in a 1,200-acre area of original forest in the East Tionesta tract showed that the dominant stand (trees 70 ft. or more in height) is made up almost entirely of hemlock and beech, with small percentages of sugar and red maple, yellow and black birch, black cherry, and others. The absence of white pine leads to the statement that the East Tionesta Forest represents an advanced ecological stage, perhaps a climatic climax of the region. Absence of fire is conceded to be an important factor in producing and perpetuating the hemlock-beech association. On certain sites the hardwood species seemed to have dominated the stand for long periods of time, while elsewhere hemlock is now dominant and on certain stream bottom sites perpetuates itself apparently indefinitely almost to the exclusion of hardwoods. The characteristic composition appears to be a forest in which hemlock and beech grow side by side and may both be represented in a dormant height class. The establishment of hemlock and beech appears the result of natural selection under the prevailing climate, soil, and animal population.

Effects of varying densities of hardwood cover on growth and survival of shortleaf pine reproduction, W. R. Becton (*Jour. Forestry, 34 (1936), No. 2, pp. 160–164, figs. 3*).—Studies on State Forest No. 3 at Maydelle, Tex., where an original stand of shortleaf pine was cut over in 1911 to an 8-in. diameter limit and where fires occurred frequently up to 1926, when protection was inaugurated, showed that the increased rate of growth and density of the hardwoods following the suppression of fire was choking back the pine reproduction but had no material influence on the older pines left in 1911. It was apparent that where pine is established at the same time or only a little later than the hardwoods the latter have only a slight detrimental effect. The pine reproduction must grow faster than the competing hardwoods or it can never overcome the competition. From a practical standpoint the competing hardwoods must be reduced or removed before a stand of pine can be established.

Artificial reforestation in the southern pine region, P. C. Wakeley (*U. S. Dept. Agr., Tech. Bul. 492* (*1935*), *pp. 115, figs. 23*).—Stating that there is much land in the southern pine region that is better adapted to forest production than to any other use but which has been rendered unproductive through undesirable logging methods and fires, the author presents information on the various operations, such as the collection, storage, and treatment of seeds; location, preparation, and care of seed beds; location and preparation of planting sites; planting; and protection of the plantation from fire, insects, etc. Included in the paper are several tables, such as the germination of seeds as influenced by methods of extraction, effect of stratification of seeds in moist acid peat at low temperatures, and the effect of date of sowing on germination and the size of 1-yr. stock.

Changes resulting from thinning in young pine plantations, W. R. Adams (*Jour. Forestry, 34* (*1936*), *No. 2, pp. 154–159, fig. 1*).—The material presented was taken largely from Bulletin 390 of the Vermont Experiment Station (E. S. R., 73, p. 788).

Trees and erosion control, A. C. McIntyre (*Amer. Soil Survey Assoc. Bul. 16* (*1935*), *pp. 110–114*).—This discussion is based, in part, upon experimental work carried out cooperatively by the Pennsylvania Experiment Station and the Soil Erosion Service, U. S. Department of the Interior. In indicating the nature of the work undertaken and of the information thus far secured, the author points out that "vegetation, whether tree, shrub, weed, or grass, functions in four ways to impede soil movement. The aerial parts, the litter, and the roots act mechanically. In addition, the influence that a particular species has on its associated species may control their vegetative density. In an attempt to obtain data on these mechanical and biotic factors, a series of studies was begun, the results of which give comparative values to a number of the more important forest trees for erosion plantings." In considering the choice of species for erosion control plantings, he notes that "taprooted species are difficult to handle. Most hardwoods develop taproots and with few exceptions do not establish themselves as readily as conifers. Mixed plantings are desirable, for many reasons. Extreme losses due to insects or disease are not as likely to occur. The future value of the planting in terms of forest products is increased."

Influence of forest litter on surface run-off and soil erosion, H. G. Meginnis (*Amer. Soil Survey Assoc. Bul. 16* (*1935*), *pp. 115–118, fig. 1*).—A communication from the U. S. D. A. Southern Forest Experiment Station reports, in part, that: "Forest litter contributes greatly to ground storage of rainfall, even when the underlying soil was previously in an extremely compacted and unabsorptive condition." The addition of forest litter reduced erosion to a negligible quantity and decreased surface run-off from 1 year's precipitation by more than half.

"The results of this study emphasize the importance in reforesting similar eroded soils, of such procedure as close spacing of trees, the use of herbaceous cover crops, and the employment of cultural or protective treatment that will make for the most rapid production and maintenance of a litter cover."

Timber growing and logging practice in the Southwest and in the Black Hills region, G. A. Pearson and R. E. Marsh (*U. S. Dept. Agr., Tech. Bul. 480* (*1935*), *pp. 80, figs. 24*).—Based on observations and experimental results, information is presented on the geography and physiography of the region; present condition of the forests; rates of growth; timber-cutting practices; minimum measures, such as fire protection, slash disposal, cutting, logging, and grazing, necessary to keep the forest lands productive; and finally measures that would be necessary to produce full timber crops. Data are presented on the probable yields under good management and on costs and returns.

In conclusion the authors state that timber growing cannot be generally recommended in this area as an investment for private capital but is regarded as feasible and necessary as a public enterprise. The intensity of silvicultural measures should be governed by the productive capacity and accessibility of the land.

A comparison of several methods of making moisture determinations of standing trees and logs, B. J. Huckenpahler (*Jour. Forestry, 34 (1936), No. 2, pp. 165–168, fig. 1*).—Data collected in July and August 1932 on 12 old field shortleaf pines ranging from 6 to 8 in. diameter at breast height and 25 to 30 ft. tall indicated that the moisture content at various points in standing trees and logs may be determined without felling the tree or cutting the log into small sections, and that the more accurate block value for the moisture content of the cross section of trees and logs may be predicted by using increment cores as samples. The auger-boring value was consistently lower than the block cross section determination. The distribution of moisture in the tree at different parts of the cross section may also be determined from parts of increment cores.

The construction of normal-yield and stand tables for even-aged timber stands, J. G. Osborne and F. X. Schumacher (*Jour. Agr. Res.* [*U. S.*], *51 (1935), No. 6, pp. 547–564, figs. 11*).—In presenting a description of a method of constructing normal yield tables, the authors state that the method does not presuppose, as does the Bruce-Reineke method, that the coefficient of variation of yield of the entire stand is the same at all stages. The new method, using normal stands of red gum as examples, shows that the coefficient of variation for height of dominant stand, for volume, and for number of trees is dependent upon the age of the stand. The basis of the method is that the relation of the standard deviation, or the coefficient of variation of yield, to stand age determines the form of the growth curve of any site index from the growth curve of the average site index. Stand tables are constructed by application of the Pearl-Reed population growth curve to cumulative frequency distributions of red gum × diameter-breast-high classes. A method of harmonizing the curves through adjustment of the descriptive constants two at a time, by successive approximation, is described. The work is said to be less laborious than the use of the Gram-Charlier series and more objective than the strictly graphic methods of constructing stand tables.

Factors involved in the application of form-class volume tables, C. E. Behre (*Jour. Agr. Res.* [*U. S.*], *51 (1935), No. 8, pp. 669–713, figs. 18*).—At the U. S. D. A. Northeastern Forest Experiment Station variations of form quotient and of bark thickness and butt swell in 2,189 trees of red spruce, white spruce, and balsam fir were studied by methods of multiple curvilinear correlation in relation to such factors as form point, diameter, height, crown length, crown class, age, site index, and density of stand. It was found that form quotient of individual trees could be estimated from diameter, height, and crown percentage with slightly greater accuracy than from form point, which had no superiority over length of crown alone. In even-aged stands average form quotient may also be estimated from age and number of trees per acre. Average form quotient increased rapidly up to an age of 70 yr. or to a density of 1,200 trees per acre more than 3 in. in diameter. Bark thickness and butt swell at breast height did not appear to be definitely related to any of the measurable factors except diameter. The determination of average form quotient was shown to be a more important source of error in the estimation of volume of standing timber in the species studied than allowance for butt swell and bark thickness, but the latter approached the former in significance in the larger-sized old-growth timber. Form class volume tables are said to afford little advantage in actual use over properly constructed tables of conventional form because so much of the variation in form quotient, bark thickness, and butt swell that can be accounted for is associated with diameter and height.

DISEASES OF PLANTS

[Plant disease studies] (*U. S. Dept. Agr., Bur. Ent. and Plant Quar. Rpt., 1935, pp. 5–8, 31–36, 41–44*).—Progress reports are given on phony peach disease control; citrus canker eradication; Dutch elm disease eradication; white pine blister rust control and quarantine enforcement; quarantine enforcement against black stem rust of cereals; barberry eradication; surveys of cereal rusts; and studies on the classification and testing of barberries, with special reference to rust resistance.

The National Academy of Sciences.—III, Abstracts of papers presented at the autumn meeting (*Science, 82 (1935), No. 2139, pp. 620–624*).—The following, of interest to phytopathology, are included: Virus concentration in relation to acquired immunity from tobacco ring spot, by W. C. Price (pp. 621, 622); and studies of the nature of rust resistance in beans, by S. A. Wingard (p. 622).

The Plant Disease Reporter, January 15, 1936 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 20 (1936), No. 1, pp. 23, fig. 1*).—Among other things of current interest included are the following: Notes on fruit diseases in the Ozark section of Missouri and Arkansas in 1935, by M. A. Smith and J. C. Dunegan; apple diseases in Pennsylvania in 1935 (being a tabulated summary of a survey), by R. S. Kirby, G. L. Zundel, L. T. Denniston, and A. Bauer; barley disease survey during the season of 1935 (including a map and tables); pea diseases in California in 1935, by W. C. Snyder; observations on strawberry dwarf in North Carolina, by G. A. Meckstroth; nematodes on alligator weed (*Alternanthera philoxeroides* being reported as a new host for the root-knot nematode *Heterodera marioni*, with the accompanying danger of strawberry infestation from this steadily invading weed), by A. G. Plakidas; and the isolation of *Macrosporium commune* from leaf spots on lilac (*Syringa vulgaris*), by T. B. Post.

Plant pathology (*Arkansas Sta. Bul. 323 (1935), pp. 44–47*).—Summaries are given of a genetical, physiological, and pathological study of the cotton plant, with special reference to cotton wilt and the breeding of wilt-resistant varieties, by V. H. Young, J. O. Ware, and O. A. Pope; a study of the etiology and control of seedling blights and boll rots of cotton in Arkansas, by Young; studies of rice stem rot and seedling blights, by E. M. Cralley; and studies of fire blight of apples and pears, and of rose diseases, both by H. R. Rosen.

[Plant diseases in California] (*Calif. Dept. Agr. Mo. Bul., 23 (1934), No. 12, pp. 475–500*).—The following items of interest to phytopathology are included:

Bureau of plant pathology, D. G. Milbrath (pp. 475–482).—Reports are included on the discovery and eradication of the chestnut blight in California; on downy mildew (*Pseudoperonospora humuli*) of hops (first report for the State and results of a survey); celery mosaic (an uncommon form reported, with data on its destructiveness and control); *Uredo ericae* on heather (*Erica* spp.); the Dutch elm disease (Ulmaceae of the State listed, but no cases yet reported); crown gall (methods of infection in seedlings and nursery trees); broomrape (*Orobanche ramosa*) as a tomato parasite; olive knot survey; nematodes (*Hete-*

rodera marioni) infesting tube rose (*Polianthes tuberosa*) (controlled by "bulb" treatments); the incidence of *Sclerotium rolfsii* causing southern root rot in various field crops; diseases of figs; and buckskin of cherry as the major pest of sweet cherries in California.

Bureau of plant quarantine, A. C. Fleury (pp. 483–500).—Reports are included on the quarantine relations of downy mildew of hops, Dutch elm disease, citrus canker and melanose, and chestnut bark disease; and notes are given on the pathological interceptions of the bureau.

[Phytopathological studies by the Cornell Station] (*[New York] Cornell Sta. Rpt. 1935, pp. 85, 86, 112–122*).—Progress reports are given on studies relating to control of diseases of potatoes, beans, and hollyhocks by the development of disease-resistant stocks, and virus diseases of potatoes, both by D. Reddick; factors affecting the efficiency of potato spraying, by F. M. Blodgett, E. O. Mader, R. B. McCormack, O. D. Burke, G. F. McLeod, W. Dickison, and H. Menusan; silver-scurf disease of potatoes, by Blodgett and Burke; potato yellow dwarf, by K. Fernow, Blodgett, and L. M. Black; lime-sulfur and substitute fungicides for apple scab control in western New York, by W. D. Mills; fire blight of apple, pear, and quince, and the modes of entry of fire blight bacteria into the flowers of fruit trees, both by E. M. Hildebrand; diseases of beans, by W. H. Burkholder and A. L. Harrison; nomenclature, classification, and physiology of the bacterial plant pathogens, by Burkholder and C. C. Wernham; the Dutch elm disease, by D. S. Welch, K. G. Parker, L. J. Tyler, P. W. Claassen, and P. A. Readio; field control of celery blights, by A. G. Newhall and M. B. Linn; electric soil sterilizers, by Newhall, and M. W. Nixon; diseases of lilies, by D. K. O'Leary; diseases of narcissus and other flowering bulbs, by F. A. Haasis; diseases of cyclamens and other potted plants, by D. L. Gill; damping-off of ornamental seedlings and its control, by C. E. F. Guterman and L. M. Massey; the cork and rosette disease of apple, and field testing of fungicides for apple scab control, both by A. B. Burrell and H. J. Miller; the taxonomy of species of North American Sclerotiniae, by H. H. Whetzel; diseases of bulbous ornamentals caused by sclerotial fungi, by Whetzel and Massey; the stimulative action of copper protectants on potatoes, by Whetzel, Blodgett, and Mader; and diseases of roses, by Massey, E. W. Lyle, and K. Longree.

[Plant disease studies by the New York State Station] (*New York State Sta. Rpt. 1935, pp. 30–36, 38*).—Progress reports are given on the diseases of small fruits in western New York (including the control of virus diseases in black raspberries, wild red raspberries as virus sources, mosaic in purple raspberries, delayed spring foliation of black raspberries caused by mosaics, and "June yellows" in strawberries); the evaluation of different applications of lime-sulfur for apple scab in 1934; fruit disease investigations in eastern New York (including apple scab, cedar rust, and strawberry root rot); diseases of canning crops (including the treatment of pea seed with red copper oxide, the effect of weather on seed decay, damping-off, and root rot, mosaic in refugee beans, and damping-off in greenhouses); red copper oxide as a spray and dust fungicide; downy mildew on hops; plant disease investigations on Long Island (including the root knot nematode of potatoes, potato seed treatment, and potato scab control); the detection of fungus seed associates; and vetch anthracnose.

[Contributions on phytopathology] (*Proc. 5. Pacific Sci. Cong., Canada, 1933, vol. 4, pp. 2579–2583, 2615–2625, 3169–3253, 3329–3335, figs. 5*).—The following papers of interest are included:

Breeding [of Plants] for Disease Resistance, by H. Wenholz (pp. 2579–2583); The Relation Between Physiologic Forms of Phytopathogenic Fungi and the Problem of Breeding for Resistance to Disease, by O. S. Aamodt (pp. 2615–

2625); Some Aspects of Cereal Rust Problems in Australia, by W. L. Waterhouse (pp. 3169–3176); Epidemiology of Cereal Rusts, by E. C. Stakman (pp. 3177–3184), a contribution from the Minnesota Experiment Station in cooperation with the U. S. D. A. Bureau of Plant Industry; Cereal Diseases and Some Aspects of Cereal Disease Investigations in Japan (pp. 3185, 3186), and On the Distribution of Cereal Rusts in Japan and the Relation of Humidity to Germination of Urediniospores of Some Species of *Puccinia* (pp. 3187–3194), both by T. Hemmi; The Physiology of the Fungi Causing Bunt of Wheat, by W. F. Hanna (pp. 3195–3204); The Summerfallow in Relation to Foot-Rot Diseases of Wheat in Western Canada, by A. W. Henry (pp. 3205–3209); The Nature of Immunity in Plants, by J. G. Dickson (pp. 3211–3219), a contribution from the Wisconsin Experiment Station in cooperation with the U. S. D. A. Bureau of Plant Industry; Recent Advances in the Biology of Plant Rusts, by J. H. Craigie (pp. 3221–3227); The Relation Between Climate and the Incidence of Some Orchard Diseases in British Columbia, by J. W. Eastham (pp. 3229–3232); The Control of Plant Diseases Caused by Nematodes, by W. Newton, R. J. Hastings, and J. E. Bosher (pp. 3233–3238); Suggestions for a Pan-Pacific Survey of Rice Diseases, by N. E. Stevens (pp. 3239, 3240); Diseases and Fungi Reported on Rice, by J. I. Wood (pp. 3241–3246); Polyporaceae of China Listed in the Publications of the Science Society of China, by L. Ling (pp. 3247–3250); International Co-operation in the Development of Mycology, by S. C. Teng (pp. 3251–3253); and Characteristic Plant and Fruit Diseases of Tropical Plants Caused by Pythiaceous Parasites, by C. P. Sideris (pp. 3329–3335).

[Abstracts of papers presented at the fourth annual meeting of the Canadian Phytopathological Society] (*Sci. Agr., 15 (1935), No. 6, pp. 435–437*).—Abstracts of the following papers are included: Inoculation Studies [with *Valsa leucostoma*, *V. cincta*, and *Sclerotinia americana*] in Peach Canker, by R. S. Willison; The Control of Brown Heart in Turnips, and Magnesium Deficiency in Potatoes, both by D. J. MacLeod and J. L. Howatt; The Influence of Rootlet Killing on the Growth Response of Apple Trees Grown in Liquid Culture, by J. C. Roger; On the Merit of Treating Potato Tubers to Reduce Disease and Loss Caused by *Rhizoctonia solani* Kühn, by G. B. Sanford; Studies on the Overwintering of Certain Fungi Parasitic and Saprophytic on Fruit Trees, by L. W. Koch; and The Analysis of a Complex Mosaic of President Potato, by D. F. Putnam.

Report of the mycologist, 1934, G. B. WALLACE (*Tanganyika Dept. Agr. Ann. Rpt., 1934, pp. 90–93*).—Among other things, observations and progress reports of studies on the following subjects are included: Root disease of coffee, tea, etc., due to *Armillaria* sp. (with 31 hosts known, of which 15 have not been recorded elsewhere); a disease of coffee, tea, etc., due apparently to a fungus belonging to the family Stilbaceae (observed on 15 economic species and on an indigenous tree); yellowing of coffee plants due to a variety of causes; tobacco mosaic and wildfire; stem rot of sisal, apparently of infectious origin but with reduction by use of artificial manures; glume-blotch (*Septoria nodorum*) of wheat; *Helminthosporium oryzae* on rice, sugarcane mosaic in a native field; leaf curl disease of cassava; cancerous lesions of unknown cause in avocado pear; and records of ring blotch of citrus, downy mildew of grapes, leaf curl of peach, *Poinciana regia* as an additional host for *Ustulina zonata*, and a vascular disease of *Pelargonium* sp., believed to be due to *Bact*[*erium*] *solanacearum*.

British stem- and leaf-fungi (Coelomycetes): A contribution to our knowledge of the Fungi Imperfecti belonging to the Sphaeropsidales and the Melanconiales.—I, Sphaeropsidales, W. B. GROVE (*Cambridge, Eng.:*

Univ. Press, 1935, vol. 1, pp. XX+488, figs. 31).—All the species described in this manual have been seen and microscopically examined by the author, except where indicated to the contrary. In the main, the account given of each species is purely morphological, few pathological or cultural details being given, except very briefly. Included are all the British Sphaeropsidales to the end of the Scolecosporae.

New species are described for the following genera, the figures in parentheses indicating the number for each genus: *Phyllosticta* (1), *Asteroma* (2), *Sphaeronaema* (2), *Phomopsis* (6), *Cytospora* (1), *Ceuthospora* (1), *Ascochyta* (3), *Ascochytula* (2), *Diplodina* (3), *Septoria* (2), and *Rhabdospora* (1), Indexes of hosts and of binomial names are provided.

A phenomenon in Fungi Imperfecti, H. N. Hansen (*Science, 82 (1935), No. 2138, p. 593*).—This is a preliminary report of studies with 28 strains (12 species) of Fungi Imperfecti as showing a dissociative phenomenon similar to that observed in bacteria in that single-spore culture series gave rise to three growth types, viz, "M", mainly mycelial in character with little or no conidial production; "C", usually with limited mycelial growth but with abundant conidia; and "X", intermediate between M and C. The behavior of the cultures indicated the X type to be heterocaryotic and the M and C phenomenon to be due to dissociation of discrete nuclei rather than to mutation or nuclear change.

Diffusible nature of the inhibitory agent produced by fungi, J. C. Carter (*Phytopathology, 25 (1935), No. 11, pp. 1031–1034*).—Several combinations of a number of micro-organisms grown in combinations of twos on potato dextrose agar exhibited a specific antagonistic action. *Helminthosporium sativum* with "bacterium 9a2" induced a more definite mutual inhibition than any of the other combinations. The inhibitory agent diffused from stale agar both into sterile agar and into sterile distilled water. The latter containing the diffusible inhibitory agent is designated as "stale water." Further growth of *H. sativum* was definitely inhibited both on the stale agar and on agar made from the stale water. The inhibitory agent was thermostable.

The occurrence in nature of mutual aversion between mycelia of hymenomycetous fungi, H. J. Brodie (*Canad. Jour. Res., 13 (1935), No. 3, Sect. C, pp. 187–189, pl. 1*).—In a herbarium specimen of *Corticium calceum* two mycelia, differing both in color and texture, had grown toward one another on the wood substrate, and between them there had developed a distinct gap or barrage It was plainly not the work of insects, but, judged by several characters, was a true barrage formed under spontaneous conditions. It is suggested that careful search among fungi which form flat mycelial expanses may reveal that the barrage effect occurs commonly in nature.

A preliminary note on bio-antagonism: An Aspergillus sp. as a deterrent on Fusarium moniliforme, P. D. Karunakar (*Assoc. Econ. Biol., Coimbatore, Proc., 2 (1934), pp. 9–15, pls. 2*).—In the laboratory experiments here reported, there was an antagonistic effect of the saprophyte (*Aspergillus* sp.) on the parasite (*F. moniliforme*) which minimized the growth and activity of the latter. This effect is believed to be due to the unfavorable environmental conditions induced by the *Aspergillus*, a part of which lies in the decrease in the pH value below the optimum (from pH 5 to 6) for the *Fusarium*.

Some views on the morphology and phylogeny of the leafy vascular sporophyte, I. M. P. Brown (*Bot. Rev., 1 (1935), No. 10, pp. 383–404*).—In this general review, taking account of the more recent literature (with a bibliography of 63 titles), discussions are included on the early microphyllous forms and on the forerunners of the megaphyllous plants.

Armillaria root rot in East Africa (Armillaria mellea (Vahl.) Quél.), G. B. Wallace (*East African Agr. Jour., 1 (1935), No. 3, pp. 182–192, figs. 5*).—The author gives a general discussion of this root rot, with particular reference to conditions in East Africa where it is known in all the colonies and on 48 species of host plants here listed. The discussion includes data on the distribution and symptoms of the disease, the fructifications and parasitism of the fungus, resistance and susceptibility of the hosts, method of spread of the disease, and control methods.

A taxonomic and morphological study of the genus Cuscuta, dodders, in North Carolina, B. E. Smith (*Jour. Elisha Mitchell Sci. Soc., 50 (1934), No. 1–2, pp. 283–302, pls. 5*).—Of the seven species of *Cuscuta* known in the State and collected and studied by the author, two are here reported for the first time there. An identification key is provided.

The Fusariums: Descriptions, injurious activities, and control, H. W. Wollenweber and O. A. Reinking (*Die Fusarien, ihre Beschreibung, Schadwirkung und Bekämpfung. Berlin: Paul Parey, 1935, pp. VIII+355, figs. 95*).—The three main sections of this monograph deal, respectively, with *Fusarium* systematics (including the genus characterization, a list of species with perfect stages where known, a list of the 16 *Fusarium* groups with their contained species, and descriptions of *Fusarium* species and their known perfect stages arranged by, and with keys to the species under, the supraspecific groups); *Fusarium* pathology; and *Fusarium* synonymy and homonymy. A subject index is provided.

The metabolism of Fusarium lycopersici and F. lini [trans. title], G. Luz (*Phytopath. Ztschr., 7 (1934), No. 6, pp. 585–638, figs. 24*).—The author reports the detailed methods and results of a study of these two species of *Fusarium* with reference to changes in the acidity of media induced by them, the relations of pH values to their growth, the buffering of their culture solutions, their intake of nitrogen and ash constituents, culture tests with sulfate-free media and with media containing ammonium sulfate, the metabolic products in the cultures, and the wilt-inducing action of culture solutions of *F. lycopersici* on tomato plants.

Galls and "galls," B. W. Wells (*Jour. Elisha Mitchell Sci. Soc., 50 (1934), No. 1–2, pp. 65–74*).—The primary purpose of this contribution from the North Carolina Experiment Station is to point out the unique character of the higher galls (zoocecidia or prosoplasmas) and to show that they are not pathological structures in the same sense as the lower galls. The higher galls indicate that a biological mechanism of differentiation exists which is independent of chromosome continuity. They furnish notable exceptions in growth of the kind of variations the investigator should be hoping for in his attack on the profound mystery of differentiation.

Superiority of silver nitrate over mercuric chloride for surface sterilization in the isolation of Ophiobolus graminis Sacc., F. R. Davies (*Canad. Jour. Res., 13 (1935), No. 3, Sect. C, pp. 168–173, figs. 2*).—When silver nitrate was substituted for mercuric chloride in the surface sterilization of infected material, *O. graminis* was isolated with considerably greater success. When similar concentrations of these chemicals were added to nutrient agar the silver nitrate proved the less toxic to this fungus, whereas the reverse was true for *Helminthosporium sativum*.

Studies on the host range of Phytomonas stewarti and P. vascularum, S. S. Ivanoff (*Phytopathology, 25 (1935), No. 11, pp. 992–1002, figs. 3*).—In this work at the Wisconsin Experiment Station, leaf symptoms were induced with strains of *P. stewarti* on sorghum, Sudan grass (*Holcus sudanensis*), yellow foxtail grass, German foxtail millet (*Setaria italica stramineofructa*), and common millet, which, in general appearance, resembled the leaf stripes of Stewart's disease on maize induced by this pathogen. Similar symptoms were induced in the greenhouse by *P. vascularum*, the causal organism of Cobb's disease of sugarcane, on maize and sorghum. The sugarcane organism, in addition, caused a rotting of the maize stalk similar to that due to *P. stewarti* on this host. *P. vascularum* also produced cavities in the sorghum stalk. Minor characteristic differences in the leaf symptoms produced by the two pathogens on the various hosts were noted.

The results obtained render it probable that a study of the host range of other bacterial parasites known to induce stripe symptoms on grasses may reveal other important relationships among these pathogens.

Some notes on Phytophthora palmivora Butl. on Tecoma smithii, H. F. Davidson (*Ceylon Jour. Sci., Sect. A, Bot., 12 (1934), No. 1, pp. 37–44, pls. 2*).—This includes data on the morphology and germination of the sporangia and on the conditions favoring zoospore formation.

The powdery mildews of central Pennsylvania, L. O. Overholts and W. A. Campbell (*Penn. Acad. Sci. Proc., 8 (1934), pp. 114–124*).—This paper from the Pennsylvania Experiment Station presents a summary of the known species of powdery mildews and their hosts in this area, as represented in the herbaria of the senior author and of the Pennsylvania State College. In addition to the descriptions of the specific fungi, there are keys to the six genera included and to the species under each genus, and there is a host index of the fungi described.

Contemporary understanding of bacterial plant-diseases and their causal organisms, C. Stapp (*Bot. Rev., 1 (1935), No. 10, pp. 405–425*).—This is a review of recent progress in the study of bacterial diseases of plants, giving special attention to the lack of substantial evidence of any plant disease due to micrococci or to the spore-bearing bacteria, to the importance of the group of fluorescent rod-shaped bacteria, to the types of host reactions induced, to the relationships among various phytopathogenic groups, to a more detailed treatment of the work on crown gall and its causal organism (*Pseudomonas tumefaciens*), to the temperature and respiratory responses of diseased v. healthy plant tissue, and to the general progress in the development of scientific methods of study in this now independent branch of science. A literature list of 130 titles is included.

Studies on plant tumors and polyploidy produced by bacteria and other agents, D. Kostoff and J. Kendall (*Arch. Mikrobiol., 4 (1933), No. 4, pp. 487–508, figs. 15*).—The morphology, histology, and cytology of tumors caused by *Bacterium tumefaciens* on tomatoes and beets, by various chemicals in a variety of plants, and as a result of hybridization in tobacco are described. The structural conditions in the spontaneous hybrid tumors were similar to those in the bacterial tumors and in the tumorous proliferations induced by chemicals.

Precipitation reactions occurred between the plant extracts and the various chemicals, giving rise to tumorous proliferations. Serological reactions between the extracts of the plants used in hybridization likewise were most vigorous between those plants whose progeny developed hybrid tumors.

The polyploidy which occurs commonly in bacterial tumors became involved in the formation of polyploid shoots when buds developed from affected tissues. The possibility of such polyploidy arising from bacteria-infected material in nature suggests it as a possible factor in the origin of new plant forms.

The results of previous investigations (E. S. R., 68, p. 630) are reviewed, and an attempt is made to interpret tumor formation in the light of the chromosomal abnormalities resultant on irregularities commonly present in tumorous tissues.—(*Courtesy Biol. Abs.*)

Growth and survival of microorganisms at sub-freezing temperatures, H. F. SMART (*Science, 82 (1935), No. 2135, p. 525*).—Twenty-six species of bacteria, yeasts, and molds which lived in frozen fruit at 15° F. for 3 yr. were isolated, studied in pure culture, and identified with known species so far as possible. Only 5 of the 26 species failed to survive storage for 1 yr. on artificial media at 16°. These findings indicate that many micro-organisms possess remarkable faculties for survival and for adapting themselves to environmental changes, and must be taken as a warning against careless preparation of frozen food products.

On the nature of filterable viruses, R. G. GREEN (*Jour. Bact., 30 (1935), No. 3, p. 331*).—This is an abstract of a paper from the University of Minnesota.

The antigenic properties of plant viruses, H. H. MCKINNEY (*Science, 82 (1935), No. 2125, pp. 276, 277*).—This is a critique of the method of presenting the data and of some of the reasoning in a recent paper on the subject by Chester (E. S. R., 73, p. 624).

On the interactions of two strains of a plant virus: Experiments on induced immunity in plants, J. CALDWELL (*Roy. Soc. [London], Proc., Ser. B, 117 (1935), No. B 803, pp. 120–139, pls. 3*).—The author isolated two strains of aucuba mosaic of tomato—"A. G." causing green mottling and "A. Y." causing yellow mottling. Apart from severity of mottling, the two retained the properties of the source material and exhibited little or no mutability. When inoculated into tomato and zinnia, each strain inhibited the development of symptoms of the other when subsequently inoculated into the same plants. The yellow strain resembled Johnson's tobacco virus No. 6, and both yellow and green strains differed from Johnson's tobacco virus No. 1 in the same manner as the original aucuba source material. Similarly, tobacco virus No. 1, Valleau's ring mosaic virus, and tomato streak virus immunized tomato plants against subsequent inoculations of the author's yellow and green aucuba mosaic strains. The "X" virus of potato and the virus of spotted wilt of tomato had no protective action against the aucuba mosaic strains.

It was found that when a plant is inoculated with two viruses, (1) one may completely prevent multiplications of the other; (2) one may permit multiplication but inhibit symptom expression of the other; (3) both may multiply, each producing its characteristic symptoms; or (4) both may multiply, producing a cumulative disease more severe than that caused by either virus alone.—(*Courtesy Biol. Abs.*)

On the numerical distribution of micro-organisms in the atmosphere, A. S. HORNE (*Roy. Soc. [London], Proc., Ser. B, 117 (1935), No. B 803, pp. 154–174*).—"The plate method, previously used by [A. H. R.] Buller and [C. W.] Lowe, and others, has been standardized and applied for the purpose of studying the numerical distribution of micro-organisms in the air. Observations were made principally in orchards selected to show variation in environmental conditions and at different times of year. As a rule exposures were made on fine days with wind velocity not exceeding 7 miles an hour.

"The principal data available consist of numbers of fungal and bacterial growths counted on 100 sets of 10 replicates. The sets or samples were tested for conformity with Poisson distribution by evaluating X^2 and arranging the 100 values obtained for each class of micro-organisms in a frequency distribution ([R. A.] Fisher, 1930, p. 59). The result showed reasonable agreement with distribution expected for true samples of a Poisson series. For fungal genera or species, where fewer samples were available for calculating X^2, the method of summation of values of X^2 (Fisher, 1930, p. 61), was adopted. On evaluating the expression $\sqrt{2x^2}-\sqrt{2n-1}$ values not exceeding ±2 were consistently obtained, indicating no significant departure from Poisson distribution.

The evidence appears to justify the conclusion that micro-organisms are distributed at random in the air.

"The results of statistical analysis, after eliminating inefficient statistics, show that class of micro-organisms, day when observations were made, time of day, position in orchard, and rain are all effective in modifying the densities of micro-organisms. Real differential effects associated with class of micro-organisms, day, time of day, and position were in many instances obtained.

"Observations made in four different localities show differences associated with locality in actual numbers of micro-organisms counted, in degree of heterogeneity of populations, and in time of year when numbers decline to the minimum found in winter. These differences appear to be related to the standards of cultivation attained by the orchardists concerned."

Virus diseases of East African plants, II, III, H. H. Storey (*East African Agr. Jour., 1 (1935), Nos. 2, pp. 148–153, figs. 6; 3, pp. 206–211, figs. 2*).—These papers continue the series (E. S. R., 74, p. 49).

II. *Leaf curl disease of tobacco.*—This gives a general account of present knowledge of tobacco leaf curl in its scientific and practical aspects and with special reference to East African conditions.

III. *Rosette disease of groundnuts.*—This gives a general account of this important disease of *Arachis hypogaea* in both its scientific and practical aspects and with special reference to tropical and southern Africa, in all parts of which it has been observed.

Seed treatments for farm crops, B. Koehler (*Illinois Sta. Circ. 444 (1936), pp. 20, figs. 11*).—This handbook, based largely on experiments reported in Bulletin 420 (E. S. R., 74, p. 652), gives directions for application and recommended disinfectants for barley, broomcorn, corn, oats, sorghum, and wheat.

Helminthosporium root-rot of cereals, H. J. Hynes (*Jour. Aust. Inst. Agr. Sci., 1 (1935), No. 1, p. 36*).—In the course of studies of cereal root rot diseases in New South Wales the following fungi were isolated from affected plants and studied as to their taxonomy, cultural relations, and pathogenicity, viz, *H. sativum*, *H. tetramera*, and a species apparently identical with *Helminthosporium M* of Henry. Each species exhibited numerous physiological forms. The pathogenicities of a mass collection of cultures could not be predicted from their behavior on agar media.

Helminthosporium diseases of barley and their control, M. Mitra and R. D. Bose (*Indian Jour. Agr. Sci., 5 (1935), No. 4, pp. 449–484, pls. 2, figs. 4*).—*H. sativum*, *H. teres*, and *H. gramineum* are reported as causing diseases of barley in India, the symptoms of which are described. The first, common at Pusa and vicinity, causes foot and root rots, head blight, and spot formation on all aerial parts, lowers the percentage of seed germination, and reduces the crop yield. *H. teres* also occurs at Pusa, but is restricted to introduced types. *H. gramineum* is very rare at Pusa. The amount of injury done by *H. sativum* to various types of Pusa barley varies with type, season, and plat. The percentages of leaf surface destroyed by *H. sativum* and *H. teres* during 1930–34 on various types are given.

Of the various fungicides tested for control of *H. sativum*, mercuric compounds were the most successful, but none of them checked the disease entirely, due to the fact that the fungus lives in the soil and is parasitic on wheat and on several grasses. Suitable seed treatment, however, checked the disease during the more important primary phase.

Differences in the susceptibility of varieties to attack by *H. sativum* were noted, but the degree of infection was influenced by environmental factors. Since seed treatment alone does not give complete control, especially of the secondary infection, the study of resistant varieties is considered highly important.

An effective and easily applied method of inoculating seed barley with covered smut, V. F. Tapke (*Phytopathology, 25 (1935), No. 11, pp. 1038, 1039*).—The seeds in vials are shaken for 0.5 min. in a spore suspension of *Ustilago hordei* in the proportion of 1 gm of spores to 1 l of water and then left to soak in the suspension for 15 min., after which the suspension is thoroughly decanted and the moistened seeds are incubated in the vials at 20° C. for 1 day in saturated air. Finally, the seeds are transferred to open envelopes, and when dry are ready for sowing. Up to 70 percent of smutted heads were obtained in field-grown spring barleys in two successive years from seeds inoculated by this method.—(*Courtesy Biol. Abs.*)

An undescribed loose smut of barley, V. F. Tapke (*Phytopathology, 22 (1932), No. 10, pp. 869, 870*).—This note compares the fungi, and the loose smuts due to, *Ustilago nuda* and the hitherto undescribed *U. nigra* n. sp. Control of smut in plants from seed developed from inoculated flowers by seed treatment with Ceresan dust or liquid formaldehyde was effective for the latter but not for the former species.

A study of the cause of variability in response of barley loose smut to control through seed treatment with surface disinfectants, V. F. Tapke (*Jour. Agr. Res. [U. S.], 51 (1935), No. 6, pp. 491–508, pl. 1, fig. 1*).—It has been generally believed that loose smut in barley is controllable by seed treatment only through a deeply penetrating, hot-water application. However, in recent years reports of partial or complete control through seed treatment with certain liquid and dust surface disinfectants laid this theory open to question.

The present investigation has demonstrated that in the United States loose smut of barley is caused not only by the well-known *Ustilago nuda* but also by *U. nigra* (see above). The former produces only floral infection, and the hot-water method is necessary to control it through seed treatment. *U. nigra* produces both floral and seedling infection and is controllable through seed treatment with certain surface disinfectants. The promycelia of *U. nigra* produce sporidia, while those of *U. nuda* do not. The smutted heads produced by the two loose smuts are similar in appearance, except that the spore masses of *U. nigra* are dark chocolate brown while those of *U. nuda* are olivaceous brown. Hence the terms "black" and "brown" loose smut, respectively, are proposed for these two barley smuts.

A study of the causes of "blast" in oats, R. A. Derick and J. L. Forsyth (*Sci. Agr., 15 (1935), No. 12, pp. 814–824*).—The results of recent work on oat blast having shown the probability that sterility of this type is of physiological origin, the present study was initiated in 1932 and carried on through the winter of 1935, with the following main results:

Moisture relations proved to be important for blast development, applications of excess water being most effective in reducing blast both in the greenhouse and in the field. Light, also shown to be a factor in blast reduction, was most effective when applied normally, and particularly when combined with excess water.

As shown by the influence of water and light, the critical period for blast development appears to be from 6 to 8 weeks after seeding, this period varying with the water supply. Late seeding increased the amount of blast, and late tillers were more susceptible to the conditions favoring blast development.

No correlation between the percentage of blast and the number of spikelets was indicated by a statistical analysis.

Sclerotial diseases of rice in Ceylon, III–V, M. Park and L. S. Bertus (*Ceylon Jour. Sci., Sect. A, Bot., 12 (1934), No. 1, pp. 1–10, pl. 1; 11–23, pls. 2, fig. 1; 25–36, pl. 1, fig. 1*).—The following papers are included:

III. *A new Rhizoctonia disease.*—A new disease of paddy, due to a fungus similar to *R. solani* and here described, is reported in Ceylon. The fungus attacked paddy both in the seedling and mature stages, wet, shady conditions favoring development. Sclerotia buried in moist paddy soil, sealed with paraffin wax in test tubes containing maize-meal agar, placed in tap water, and kept in a corked specimen tube in the laboratory were viable after 133, 641, 571, and 141 days, respectively. Sclerotia exposed to the sun for 207 hr. during a period of 39 days were inactivated. It is suggested that the fungus be called *R. solani* strain A until the perfect stage is determined.

IV. *Sclerotium oryzae A strain.*—A disease of paddy, similar in many respects to the disease due to *S. oryzae*, is described. The fungus attacked both seedlings and older plants. Sclerotia remained viable when buried in moist paddy soil in the shade for 4.5 mo., when submerged in water for 7.5 mo., and under dry conditions for 13 mo. Sclerotia were killed on exposure to direct sunlight for 1 mo. Diseased plants should be burned in the field. The fungus is called *S. oryzae* strain A.

V. *Rhizoctonia solani B strain.*—A disease of paddy in Ceylon, due to a fungus named *R. solani* strain B, is reported and described. The fungus was weakly parasitic. Studies on the sclerotial viability indicated that flooding, burying, desiccation, and exposure to sunlight cannot be used in controlling the fungus. Diseased plants should be burned in situ.—(*Courtesy Biol. Abs.*)

Physiologic specialization in Puccinia coronata avenae, B. Peturson (*Sci. Agr., 15 (1935), No. 12, pp. 806–810*).—This rust is reported to occur to some extent almost wherever oats are cultivated in Canada, and to cause considerable losses in the eastern part. In Manitoba, Saskatchewan, Alberta, and British Columbia it is usually unimportant, but it occurred in epidemic form in the first two Provinces in 1927.

In the present study 11 physiologic forms of *P. coronata avenae* were isolated from collections in various parts of Canada (1929–34), several being common from year to year, while others were comparatively rare. The more commonly occurring forms were collected both in eastern and western Canada, but certain ones predominated in the east while others were more prevalent in the west.

An analytical key for the identification of the physiologic forms is included.

Australian rust studies.—V, On the occurrence of a new physiologic form of wheat stem rust in New South Wales, W. L. Waterhouse (*Linn. Soc. N. S. Wales, Proc., 60 (1935), pt. 1–2, pp. 71–73*).—Continuing this series (E. S. R., 73, p. 191), "specialization studies of *Puccinia graminis tritici E.* & H. have shown that between 1921 and 1934 seven forms have occurred naturally in Australia. Form 34 has been the most widespread. In November 1934, wheat from two centers in New South Wales was found for the first time to be attacked by form 11. This is one of the forms which have been derived from the barberry in the plant house when it is infected by the heterozygous form 34. Significance attaches to the discovery, in December 1933, of naturally infected barberries in New South Wales where form 34 was present on graminaceous hosts."

Excitability of the diseased organism [trans. title], **L. Montemartini** (*Riv. Patol. Veg., 25 (1935), No. 7–8, pp. 293–303*).—The author reviews the host-parasite relations of the loose and covered smuts (*Ustilago* and *Tilletia*) of cereals and records eight tests of his own with Montana wheat infected with

T. tritici or *U. tritici*, relative to the differences in phototropic and geotropic responses in infected v. healthy plants.

Histological studies of the development of the root and crown of alfalfa, A. O. Simonds (*Iowa State Col. Jour. Sci., 9 (1935), No. 4, pp. 641–659, pls. 2, figs. 3*).—This contribution from the Iowa Experiment Station reports the detailed results of the histological studies noted in the title.

"The death of the tissues in the interior of the crown may not always be attributable to mechanical injuries or to the invasion of organisms. It was common in plants undisturbed by mowing or pasturing. It was associated with the decay started in dead bases of the shoots and may be in part a natural consequence of the passing of the interior tissues into an inactive state, as in the case of many trees in which the heartwood decays after its functions are taken over by exterior layers of tissue."

Witches' broom: A new virus disease of lucerne, E. T. Edwards (*Jour. Aust. Inst. Agr. Sci., 1 (1935), No. 1, pp. 31, 32*).—This is a preliminary report of studies on a new, virus-induced disease characterized by marked dwarfing of the plant and considerable increase in the number of shoots produced from the crown. It is stated to be prevalent throughout the inland areas of New South Wales, field infections of from 20 to 25 percent being common and isolated cases of from 60 to 70 percent having been observed. Thus far the disease has been experimentally transmitted only by grafting, but an insect vector is suspected.

Some experiments with the bacterial blight of beans [trans. title], A. Christow (*Phytopath. Ztschr., 7 (1934), No. 6, pp. 537–544, figs. 2*).—In variety tests with the five varieties of beans most commonly grown in Bulgaria, only Maitschin proved highly resistant to this bacterial disease.

Spraying with bordeaux mixture afforded considerable control, but the results of tests with old v. fresh seeds indicated that it is possible to obtain plants free from the disease if sufficiently old seeds are planted. From the standpoints of good germination and freedom from bacteria the 7-year-old seeds were best, and none over 8 yr. old should be used. It was further shown that the bacteria in superficial spots on the seeds do not withstand drying for over 217 days, so that such seeds may be used for sowing during the second season after harvesting.

A combination of the use of sound seeds, late sowing, spraying when necessary, sanitary measures, and rotation of crops are the principal control measures recommended as a result of these studies.

Breeding bush beans for resistance [trans. title], F. Schreiber (*Kühn Arch., 38 (1933), pp. 287–292*).—A dry shell variety of *Phaseolus vulgaris* resistant to *Colletotrichum lindemuthianum* was crossed with a susceptible snap bean to combine resistance with canning quality. The hybrids were infected artificially with a mixture of a great number of physiological strains of the fungus. The first generation proved to be resistant, and the following generations were segregated into resistant and susceptible individuals. The resistant ones were selected and their offspring reinfected until homozygotic resistance appeared. The segregation ratios led to the conclusion that at least eight different dominant genes are responsible for resistance.—(*Courtesy Biol. Abs.*)

The relationship of certain legume mosaics to bean, W. J. Zaumeyer and B. L. Wade (*Jour. Agr. Res.* [*U. S.*], *51 (1935), No. 8, pp. 715–749, figs. 7*).—The viruses causing the mosaic disease of pea, white clover, alsike clover, white sweetclover, alfalfa, and sweet pea were all transmissible to beans, while the virus of red clover mosaic was not. The legume mosaic viruses produced systemic infection on beans, with the exception of the alfalfa virus, which produced only local lesions. The white clover mosaic virus may produce both systemic and local lesions.

In all, 31 bean varieties were tested for relative resistance and susceptibility to the different legume viruses, and the tabulated results indicate Corbett Refugee, Great Northern Idaho No. 1, and Robust to be resistant. Inoculations of these viruses into various other leguminous hosts likewise indicated differences in host susceptibility and resistance. The local lesions produced by the mosaic and ring spot viruses of tobacco differed both in symptoms and varietal susceptibility from those produced by the mosaic viruses of white clover and alfalfa.

The properties of these several viruses were determined and are described, and it is shown that beans may become infected with the legume viruses in the field through aphid transmission.

It should be noted that the captions of figures 1 and 3 are interchanged.

Investigations of the Orobanche on broadbeans.—I, Seed germination [trans. title], E. del Giudice (*Staz. Sper. Granicolt., Catania, Sicilia, Pub. 7 (1935), pp. 27, pls. 5*).—Seeds of *O. speciosa* were germinated for the first time apart from contact with the host plant roots by treatment for 24 hr. with concentrated ammonia at from 26° to 30° C.—(*Courtesy Biol. Abs.*)

Observations and researches on the black spot disease of cauliflower [trans. title], E. Agustoni (*Riv. Patol. Veg., 25 (1935), No. 7–8, pp. 305–315, figs. 2*).—The author compares the spot diseases due to *Bacterium maculicolum* and *Alternaria brassicae*.

Black arm disease in Uganda, C. G. Hansford (*East African Agr. Jour., 1 (1935), No. 2, pp. 131–134*).—This is a general account of the bacterial black arm disease of cotton, with special reference to Uganda conditions. It was first recorded there in 1925, but had probably been present for some years before that date. The history of the disease, its symptoms, the effects of climatic factors, the relations to insect pests, the perpetuation of the disease from year to year, its effects on the host plant, and varietal resistance are each briefly discussed.

A new disease of cotton (Gossypium sp.) in the Philippines, F. M. Clara (*Philippine Jour. Agr., 6 (1935), No. 2, pp. 217–225, pls. 3*).—A fungus, identified as *Helminthosporium gossypii* (E. S. R., 54, p. 846), is reported as causing noticeable damage to cotton in Manila in 1933 and also, though less severely, in 1934.

Studies on the root-rot disease of cotton in the Punjab.—I, Symptoms, incidence, and cause of the disease, R. Sahai Vasudeva (*Indian Jour. Agr. Sci., 5 (1935), No. 4, pp. 496–512, pls. 2, figs. 2*).—The cotton root rot, the symptoms of which are described, is reported to cause very serious damage to the crop in the Punjab. The attack appears first in June, continues vigorously during July, slows down in August, and almost ceases by the end of September. Several micro-organisms were isolated from affected plants, and pot and field tests, using various methods, indicated that *Rhizoctonia solani* and a fungus provisionally identified as *R. bataticola* each may cause the disease.

Spurious cucumber "mosaic" due to copper poisoning, J. Caldwell (*Jour. Min. Agr. [Gt. Brit.], 42 (1935), No. 2, pp. 97, 98, pl. 1*).—This is a preliminary report on a mosaic of cucumber leaves shown to be due to copper poisoning. The symptoms were a "clearing of the veins" and distortion, particularly well marked in the first foliage leaf.

Physiologic specialization of Melampsora lini on Linum usitatissimum, H. H. Flor (*Jour. Agr. Res. [U. S.], 51 (1935), No. 9, pp. 819–837, pl. 1*).—Strains of Buda (C. I. 270), Williston Golden (C. I. 25), Williston Brown (C. I. 598), Akmolinsk (C. I. 515), J. W. S. (C. I. 708), Kenya (C. I. 709), "very pale blue crimped" (C. I. 647), Argentine (C. I. 705), and Abyssinian (C. I. 701) were selected as differential varieties for the identification of physiologic forms of *M. lini* on flax. From 99 collections of *M. lini* made in the United States and Canada, 14 physiologic forms were distinguished by the reaction of these differential varieties.

Several forms of the rust were widely distributed in Minnesota, North Dakota, South Dakota, Oregon, and Manitoba. In several localities more than one was found.

In the 4-yr. period of these studies, 4 rust forms passed through from 20 to 30 urediospore generations without apparent change in pathogenicity. Pathogenicity tests indicated that flax varieties are not usually specific in reaction to the different forms of rust. Of 165 varieties tested, only 13 gave differential reactions to 5 forms. Many varieties were not pure lines in respect to rust reaction, but lines pure for this characteristic were readily obtained by plant selection.

Investigations of flax wilt [trans. title], H. GROSSMANN (*Phytopath. Ztschr., 7 (1934), No. 6, pp. 545–583, figs. 3*).—The growth curves of *Fusarium lini* in like periods of time on various media agreed with one another only at the cardinal points, viz, from 6° to 9°, 27°, and 33° C.

By growing the Newland variety of flax for 15 days at 12° and then for 21 days at various temperatures, it was shown that 27° is the optimum soil temperature for its development. Likewise the highest incidence of wilt occurred, both in the susceptible Newland and in the resistant Bison varieties, at this same temperature. The Bison became diseased only when the temperature was high immediately after germination, and when held at 12° for 15 days it was resistant at all temperatures.

At a dilution of 1:5, the Richards or similar nutrient solutions in which *F. lini* had been cultured for 6 weeks caused flax to wilt, whereas the original nutrient solution similarly diluted had no injurious effects. These results are similar to those obtained by others for *F. cubense*, *F. lycopersici*, *F. oxysporum*, and *F. vasinfectum*. In tests with solutions of the toxic principle, the higher the temperature the more rapid was the wilting of the plants, but the temperature at which the plants had been grown played only a subordinate role. The toxic principle also inhibited seed germination.

On placing in a toxic solution, the resistant Bison wilted as quickly as the susceptible Newland. It also caused wilting in other plants. The principle is therefore not specific, and if immune reactions exist in the Bison variety they at least appear not to be directed against the wilt-inducing toxic principle. The possible nature of this principle is discussed.

The downy mildew of the hop in 1934, E. S. SALMON and W. M. WARE (*Jour. Southeast. Agr. Col., Wye, Kent, No. 36 (1935), pp. 48–54*).—The authors report that under the exceptionally hot and dry conditions of May, June, and part of July 1934 the sporing stage of downy mildew (*Pseudoperonospora humuli*) was largely suppressed. No serious attacks on the bine occurred, therefore, and the crop was in general free of the disease. However, three attacks of commercial importance following local rains at the end of July indicated that the disease was merely suppressed rather than extinct.

The season's experience gives fresh evidence that low-lying sites for new hop gardens should be avoided.

Intracellular abnormalities associated with yellow dwarf of onions, H. D. TATE (*Iowa State Col. Jour. Sci., 9 (1935), No. 4, pp. 677–683, pl. 1*).—Working at the Iowa Experiment Station, the author found intracellular bodies in the tissues of yellow dwarf onions, although they were not numerous and were very irregularly distributed. They commonly resembled nuclei, but varied much in size, form, and structure, and usually occurred in contact with, or close to, the host nuclei. It is therefore suggested that they are possibly of nuclear origin.

In tissues from apparently healthy plants, cells that appeared to be multinucleated were occasionally found. Some cells were observed with bodies differing somewhat from typical nuclei and resembling some of the types of intracellular bodies of the yellow-dwarf onions.

The facts favor the theory that these bodies are the result of the action of the virus on the protoplasm, rather than that they are the actual etiological agents of the disease.

A study of resistance to Fusarium wilt in Alaska peas, J. C. Walker (*Amer. Jour. Bot.*, *22* (*1935*), *No. 10*, *pp. 849–857*).—The results of this study from the University of Wisconsin may be summarized as follows:

Strains of peas resistant and susceptible to the wilt fungus (*F. orthoceras pisi*) constitute two clear-cut, discontinuous groups in which resistance is controlled by a single dominant gene, while both these groups are equally susceptible to the root rot fungus (*F. martii pisi*). The wilt form invades the young roots and after the early stages of penetration becomes a vascular parasite, while the root form invades and parasitizes primarily the cortex of the root and lower stem.

When the Tottingham solution in which two strains of Alaska peas (one homozygous for susceptibility to the wilt fungus and the other for resistance) had been grown for various intervals was used as a culture medium, the growth of the fungus was usually depressed in the solution from the resistant as compared with that from the susceptible plants. Similar results were obtained when the medium was prepared from extracts of fresh or dried roots. The root rot fungus grew equally well on both types of media. The difference in growth of the wilt fungus on the two types of media might be due to differences in the kind or concentration of available nutrients or to an inhibitive factor in the extract from resistant plants. However, the fact that the root rot fungus grew equally well on both types of media suggests that the resistant extract possibly contained some entity inhibitive to the wilt fungus which might be a contributing factor in the resistance of that strain of peas.

Composition of interveinal mosaic of potatoes, J. B. Loughnane and P. Clinch (*Nature* [*London*], *135* (*1935*), *No. 3420*, *p. 833*).—This is a preliminary note on studies which show that interveinal mosaic virus is a complex of two viruses, one being of the "X" type with no known insect vector, and the other selectively transmitted by *Myzus persicae*.

The geography of scab in the United States, C. L. Fitch (*Amer. Potato Jour.*, *12* (*1935*), *No. 11*, *pp. 310–316*).—From his review of the geography and soil relations of potato scab in the United States, the author concludes that the following may be given as the factors controlling the presence or absence of scab damage: The extent of the presence of the causal organism in the soil or on the seed; the possibility and the degree of infection on the tuber (the variety, and the conditions early in the season); the degree of aeration (water in the soil as a displacer of air or a hindrance to its entrance, soil texture, and the nature of the subsoil); soil reaction (lime and other alkalies present, and acid production with ammonium sulfate and sulfur); and soil temperature (air temperatures and sunshine, moisture in the soil and subsoil, and the ground-water level as controllers of soil temperature).

The response of different varieties of potatoes to different amounts of copper in a modified spray program, E. O. Mader and F. M. Blodgett (*Amer. Potato Jour.*, *12* (*1935*), *No. 12*, *pp. 325–334*, *figs. 2*).—In these studies from Cornell University, Irish Cobbler, Rural Russet, and Green Mountain potatoes planted at Pittsford, N. Y., responded to copper treatments (bordeaux mixture) to about the same extent in final increases in yields. With a mixture composed of one-half as much quicklime as $CuSO_4$ and with most of the copper applied early in the season, there appeared to be no advantage in using more than 60 lb. of $CuSO_4$ per acre for the season.

All sprayed plants retained more tubers per plant than unsprayed controls of the same variety, but all varieties gave evidence of retarded tuber development from spraying. This retardation was less pronounced with Cobblers and most so with Green Mountains. In the latter, the unsprayed plants yielded more than the sprayed until after September 21.

Potato virous diseases in 1934, D. FOLSOM (*Amer. Potato Jour., 12 (1935), No. 11, pp. 304–310*).—This is an annotated bibliography of 119 titles published during 1934.

Phyllody: A possible virus disease of Sesamum, B. P. PAL and P. NATH (*Indian Jour. Agr. Sci., 5 (1935), No. 4, pp. 517–522, pls. 4*).—Phylloid plants of *S. indicum* are characterized by the transformation of all floral parts except the stamens into leaflike structures, the different modifications of which are described. Such plants occur every year at Pusa, and the yield is often materially lowered.

In attempts to determine the cause it was found that neither heavy manuring nor growing the plants under excessive humidity increased the incidence of phylloid individuals, but that early sowings contained a larger proportion of them than late sowings. Injection of juice from affected plants into the stems of normal plants gave negative results, but the condition was transmitted by reciprocal grafting, suggesting that phyllody may be due to a virus.

Boron deficiency disease of beets, J. E. KOTILA and G. H. COONS (*Facts About Sugar, 30 (1935), No. 10, pp. 373–376, figs. 4*).—This disease of sugar beets involving necrosis of the younger tissues occurred in plants grown in nutrient solutions lacking boron. Partly expanded leaves became dark green and distorted, the blades tended to become distorted, and the petioles were shortened and on their inner surfaces exhibited black or brown, ladderlike, scabby lesions. The necrosis sometimes included the veins. Under conditions of boron deficiency, the taproots frequently developed flesh discolorations and cankers.

Plants showing these symptoms were also observed in a number of fields in Michigan and Ohio. Typical disease specimens resumed normal growth after cutting back and replanting in sand supplied with a nutrient solution containing boron at the rate of a few parts per million. The controls without boron failed to recover. The situation in these States is believed to correspond to that reported for Europe, where it has been definitely established that heart and dry rot of sugar beets may, in large part, be due to inadequate amounts of boron in the soil.

Factors affecting experimental error in greenhouse pot tests with sugar beets, E. L. LECLERG (*Phytopathology, 25 (1935), No. 11, pp. 1019–1025, fig. 1*).—In this cooperative study between the Minnesota Experiment Station and the U. S. D. A. Bureau of Plant Industry, two damping-off uniformity tests were made with sugar beets in a greenhouse, one on a raised concrete bed and the other on a board wall bench, to determine positional influence on plants. In one test the percentage of damping-off in the border rows of pots adjacent to the radial heating pipes on the raised concrete bed was markedly less than that in the adjacent rows of pots. This effect was less marked, or almost absent, in a bench with board walls. The mean air temperature of the side of the concrete bed near the heating pipes was about 8° F. warmer than the other side. With the board wall bench the condition was reversed, the mean temperature for the side near the steam coil being from 3° to 4° lower than the side more removed.

It is pointed out that proper experimental designs now in use in agronomic field experiments will overcome any bias of systematic arrangement and permit an evaluation of place effects.—(*Courtesy Biol. Abs.*)

Disease resistance tests on sugarcane seedlings and initial selection procedure in the southern United States, R. D. Rands, E. V. Abbott, and E. M. Summers (*Sugar Bul., 13 (1935), No. 24, pp. 10, 12, 14–16*).—The authors describe the methods of testing sugarcane seedlings for resistance to disease in the southern United States, and some of the results outlined and discussed are as follows:

Incomplete dominance of mosaic resistance was indicated by five "primary" crosses between susceptible noble varieties and various collections of the immune *Saccharum spontaneum*, and susceptibility was apparently increased by backcrossing various resistant seedlings with the susceptible Co. 281 parent.

A wide range of susceptibility occurred among seedling families from various "commercial crosses." Two such families tested also for resistance to red rot gave but 18 and 32 percent, respectively, of seedlings both resistant to mosaic and commercially resistant to red rot. Classification of the separate disease ratings on 705 seedlings of these two families indicated that resistance or susceptibility to one of the diseases was independent of the reaction of the same seedlings to the other diseases.

Problems connected with root disease of sugar-cane in Antigua, H. R. Briton-Jones (*Trop. Agr. [Trinidad], 13 (1936), No. 1, pp. 5–8, figs. 2*).—This consists of miscellaneous notes on sugarcane culture, diseases, and pests in Antigua. *Marasmius sacchari* is stated to be the most common fungus associated with root disease, while leaves of the variety Ba. 11569 are usually mildly attacked by gummosis (*B[acterium] vascularum*). The white grub (*Lachnosterna antiguensis*) is reported to be more numerous on plants badly affected with root disease.

Observations in relation to the tomato plant diseases as they occur in Hungary, G. Becze (*Kisérlet. Közlem., 38 (1935), No. 1–2, pp. 53–70, figs. 8; Fr., Eng., and Ger. abs., pp. 66–69*).—This survey of the tomato diseases of Hungary, including the question of susceptible and resistant varieties, discusses root and stem diseases (incidence not over 0.5 percent); leaf spot due to *Septoria lycopersici* (everywhere present and causing serious damage to the foliage); *Phytophthora infestans* leaf spot and fruit rot (injuries not significant); blossom-end rot associated with *Macrosporium* and *Phytobacter lycopersicum* (serious injury); *Fusarium* rot (severe damage); bacterial fruit spot due apparently to *Pseudomonas vesicatoria* (*Bacterium vesicatorium*) (considerable damage); black rot; wet rot due to *Gloeosporium lycopersici; Phoma* rot (the last three without significance); an internal bacterial rot; and a blossom disease (the last two apparently related to the blossom-end rot).

Occurrence of "spotted wilt" of tomato in Ontario, G. H. Berkeley (*Sci. Agr., 15 (1935), No. 6, pp. 387–392, pls. 3; Fr. abs., p. 392*).—The symptoms of a tomato disease known to the author in Canada since 1931 are described. The present study, including inoculation tests on tobacco, *Nicotiana glutinosa*, petunia, and tomato, indicated it to be the virus disease spotted wilt. In single tests the virus was inactivated at 45° C. for 10 min., and it lost its potency at from 0.5 to 2 hr. at room temperature. Control measures are suggested.

Virus diseases of tomatoes [trans. title], D. A. van Schreven (*Tijdschr. Plantenziekten, 41 (1935), No. 10, pp. 261–300, pls. 4*).—This comprehensive review with bibliography of 108 titles deals with tomato mosaic, aucuba mosaic, the different streak viruses (mixed virus streak, single virus streak, stem necrosis streak, and ring mosaic streak), spotted wilt, Huissen disease, big bud, and bunchy top.

Cultural studies on the virus of tobacco mosaic, F. H. Johnson (*Phytopathology, 25 (1935), No. 11, pp. 1035–1037*).—Attempting to obtain an increase of the tobacco-mosaic virus in vitro, "culture media" were prepared from healthy tobacco plants. Expressed sap extracted with benzol and ether gave positive results in one case that were not duplicated in a repeated test. Negative results were obtained with media prepared from desiccated alcohol-extracted leaves, from leaves frozen in liquid air, and from a saturated ammonium sulfate precipitate of expressed sap.—(*Courtesy Biol. Abs.*)

Experimental procedures in a study of the location and concentration within the host cell of the virus of tobacco mosaic, L. G. Livingston and B. M. Duggar (*Biol. Bul., 67 (1934), No. 3, pp. 504–512*).—Using epidermal hair cells of tobacco plants infected with the virus of "typical" tobacco mosaic, evidence was obtained, chiefly by the use of micromanipulative technics, indicating that the main concentration of the virus in infected cells is in the protoplasm rather than in the cell sap. Also, the infectivity of the entire content of cells with inclusion bodies, when contrasted to that of adjacent cells of the same infected plant with no visible inclusions, indicated that the virus concentration is definitely greater in cells containing the inclusion bodies. It is suggested that the inclusion bodies at least accompany the development of the virus in a high concentration. Clear demonstration was obtained that both the so-called "X bodies" and the "striate" or "crystalline" material are fragile structures, disintegrating into a granular mass when touched with the micropipette.—(*Courtesy Biol. Abs.*)

Possible chemical nature of tobacco mosaic virus, J. Caldwell (*Nature [London], 133 (1934), No. 3353, p. 177*).—Tobacco-mosaic virus obtained from the juice of *N[icotiana] glutinosa* on the crystals formed after the addition of potassium-hydrogen phosphate could not be separated, on repeated recrystallization, from the nitrogenous substances remaining as impurities in the crystals.—(*Courtesy Biol. Abs.*)

Soil contamination as a factor in crop infestation of tobacco mosaic, S. G. Lehman (*Jour. Elisha Mitchell Sci. Soc., 50 (1934), No. 1–2, pp. 44, 45*).—This is an abstract of a paper presented before the North Carolina Academy of Science May 4–5, 1934.

Recent investigations on tobacco root rot in Canada, L. W. Koch (*Canad. Jour. Res. 13 (1935), No. 3, Sect. C, pp. 174–186, pls. 3, fig. 1*).—The microscopic examination of lesions on about 1,600 roots typically affected with black root revealed many different organisms occurring singly and in various combinations with one another, but more frequently with *Thielaviopsis basicola.* These included mycorrhizal types, Rhizoctonias, including *Rhizoctonia solani* and several endophytic *Rhizoctonia* forms resembling those in orchids, Pythiums, and nematodes. In general, Fungi Imperfecti were conspicuously absent. Each of these organisms gave microscopic evidence of parasitism.

The phycomycetous mycorrhizal fungus was found not only on roots, but is here reported apparently for the first time as completely invading the stems and leaves of moss plants and the thalli of liverworts in muck soils obtained from tobacco seedbeds. Daily examination of tobacco seedlings in muck soil known to contain this form revealed its presence in 30 percent of the roots as early as 5 days after germination, and in all of them after 10 days.

Isolations from 208 typically diseased rootlets consistently yielded *T. basicola,* as well as bacteria, nematodes, and over 20 genera of fungi. The fungi most frequently associated with *T. basicola* were Pythiums, Rhizoctonias, and Fusariums. Preliminary infection experiments indicated that 1 *R. solani* type and 3 endophytes of this same genus, 5 Pythiums, and *T. basicola* all possessed parasitic properties for tobacco roots, whereas two other Pythiums, 2 Rhizoctonias, a *Mucor*, and 7 distinct Fungi Imperfecti showed no parasitic capacities under the same conditions. It is interesting to note that in a root rot hitherto considered as due strictly to one parasite other organisms also capable of primary parasitism of the host should be so constantly associated with its chief causal organism, *T. basicola*.

Cultural variations of Thielaviopsis basicola, E. M. Johnson and W. D. Valleau (*Phytopathology, 25 (1935), No. 11, pp. 1011–1018, figs. 2*).—In these studies at the Kentucky Experiment Station, cultures of *T. basicola* isolated from decaying roots of tobacco differed from one another on potato-dextrose agar. Allowed to remain in test tubes for several weeks and then transferred to Petri dishes of agar, the cultures developed numerous sectors differing markedly from the original cultures. Single-endoconidium cultures were unstable. A culture consistently failing to produce endoconidia was isolated from roots, and two similar cultures developed as sectors. An albino culture showing no tendency to produce color for 4 yr. developed as a sector. Sexual fruiting bodies did not develop in old cultures or in mixtures of two or more cultures from different sources.

Because of its unstable constitution, its many color and physical characters, and its two spore types, *T. basicola* is suggested as an ideal organism for study of the genetics of the Fungi Imperfecti.—(*Courtesy Biol. Abs.*)

A cytological study of the resistance of apple varieties to Gymnosporangium juniperi-virginianae, C. J. Nusbaum (*Jour. Agr. Res.* [*U. S.*], *51 (1935), No. 7, pp. 573–596, pl. 1, figs. 4*).—In this study from the Wisconsin Experiment Station, infections by *G. juniperi-virginianae* in the leaves of four apple varieties, each differing from the others in reaction to the fungus, were studied cytologically. The process of penetration by sporidial germ tubes was essentially the same for all four varieties, the fungus beginning its parasitic activities by forming a conspicuous primary hypha in an epidermal cell. Further development of the mycelium was regularly intercellular, accompanied by the formation of characteristic haustoria.

In Wealthy leaves of susceptible age the parasite developed vigorously in congenial relationship with the host, and as long as the invaded cells remained alive they apparently furnished a favorable substrate. The cytological changes induced are detailed. Inoculations of the dorsal surface generally failed to produce infection, the parasite being unable to establish successful contact with the cells of the spongy parenchyma. The leaves became resistant as they matured. The fungus penetrated and made considerable vegetative growth in leaves that had just attained full size but, in spite of an apparently congenial host-parasite relation, failed to initiate pycnia. The sporidial germ tubes were unable to penetrate the epidermal cells of leaves several weeks older. The complete immunity of old Wealthy leaves is attributed to physical properties of the epidermis which prevent the entrance of the fungus.

The resistance shown by the other three varieties seemed to be based on a distinct antagonism of the host-cell protoplasts for the parasite. This reaction was mild in Yellow Transparent, pronounced in Fameuse, and very severe in Baldwin.

Mosaic disease or virus chlorosis in apples [trans. title], **A. Christow** (*Phytopath. Ztschr., 7 (1934), No. 6, pp. 521–536, figs. 8*).—A serious virus disease, reported as spreading into nearly all the apple tree nurseries of Bulgaria, is characterized by light-green polygonal mosaic spots scattered over the entire leaf surface. It was seen especially on wild apple trees (seedlings). A similar disease was observed on pear, apricot, quince, peach, and plum trees, and the author reports having seen mosaic diseases on *Amygdalus communis*, *Cydonia vulgaris*, *Prunus armeniaca*, *P. avium*, *P. cerasus*, *P. divaricata*, *P. domestica*, *P. insititia*, *P. mahaleb*, *P. persica*, *P. spinosa*, *Pyrus communis*, *P. malus*, and wild roses.

On the small budded trees the virus chlorosis appeared most characteristically as a chlorosis accompanied by a leaf burn, in many cases resulting in complete drying up and death of the plants. Simultaneously, the roots became necrotic, this condition progressing from the tips up the main root into the stem.

Secondary parasitic and saprophytic micro-organisms hastened the death of the trees. However, some of the trees apparently overcame the disease, the following years developing normal leaves except for occasional mosaic spots. None of the fungi isolated produced the disease, but the virus transmitted it through bud grafts. Control measures are suggested.—(*Courtesy Biol. Abs.*)

Bordeaux mixture-nicotine combinations against aphis and apple scab, M. D. Austin, S. G. Jary, and H. Martin (*Jour. Southeast. Agr. Col., Wye, Kent, No. 36 (1935), pp. 95–99*).—Two preblossom applications of combined sprays were tested over two seasons with the following results:

Trees receiving the bordeaux-sulfite lye-nicotine and the cottonseed oil-bordeaux-nicotine mixtures had a lower aphid infestation at the end of the second season than either the unsprayed controls or those sprayed with the bordeaux-nicotine mixture, but the degree of control was inferior to that normally given by the tar distillate washes.

As to fungicidal efficiency, the two modified bordeaux sprays were equal to the ordinary mixture. The oil-bordeaux mixture caused less foliage injury and fruit russeting than the other two bordeaux sprays.

The development of scab in stored apples, H. Wormald (*Jour. Min. Agr. [Gt. Brit.], 41 (1934), No. 6, pp. 551–556, pls. 2*).—The author describes a type of scab spot developing on apples after harvesting and during storage. This differs from that on the tree, but is here shown to be due to the *Fusicladium* stage of *Venturia inaequalis*. Routine spraying and storage of apples only after they are dry are measures recommended for control.

The control of apple scab: Allington Pippin and Newton Wonder, 1934, W. Goodwin, N. H. Pizer, E. S. Salmon, and W. M. Ware (*Jour. Southeast. Agr. Col., Wye, Kent, No. 36 (1935), pp. 55–61, fig. 1*).—In the tests here reported, trees of the Allington Pippin variety sprayed four times with home-made bordeaux mixture (8–12–100)—twice preblossom and twice postblossom—gave 2.8 percent of scab-affected apples, and with cottonseed oil-bordeaux emulsion at half the strength of copper and lime 3.2 percent. The three unsprayed control plats gave an average of 31.8 percent of scabby apples. Tests with the Newton Wonder variety gave results of essentially the same order.

The attacks of scab were light and evidently late, and hence it was impossible to ascertain any significant differences in the fungicidal efficiency of the two sprays during this season.

Progress report on pear scab in Oregon, L. Childs and J. Kienholz, Jr. (*Northwest Assoc. Hort., Ent., and Plant Path., Kelowna, B. C., 1 (1935), Abs. Papers, p. 5*).—This is an abstract of a contribution from the Oregon Hood River Substation in cooperation with the U. S. D. A. Bureau of Plant Industry.

A rot of pear caused by the red bread-mold fungus, M. Waynick (*Jour. Elisha Mitchell Sci. Soc., 49 (1934), No. 2, pp. 285–288, figs. 2*).—From a soft rot of pears under market conditions *Neurospora sitophila* was isolated, and subsequent inoculations of pears under controlled conditions resulted in brown, decayed areas soon covered with mycelium producing conidia. The fungus was shown to be entirely intercellular and to cause a dissolution of the middle lamella somewhat in advance of the invading hyphae. This results in the separation of the cells, disintegration of the cell walls, and final utilization of the cell contents by the parasite. The cultural characters of the fungus are given.

High fertility aids control of strawberry root rot, E. J. Anderson (*Amer. Fruit Grower, 55* (*1935*), *No. 12, pp. 7, 20, 21, figs. 2*).—This semipopular contribution from the University of Maryland discusses symptoms, causes, and control, with particular reference to the favorable influence of high fertility.

Annual report of banana disease investigations for the year 1934, B. E. V. Parham (*Fiji Dept. Agr. Ann. Bul., 1934, pp. 41–48*).—This reports progress in the experimental work of the department through the isolation of *Fusarium* sp. as the probable cause of a serious wilt of bananas; the definite correlation of the virulence of *Cercospora musae* with soil and other conditions; the completion of a survey of the main banana areas; a study of the varietal susceptibility to diseases of many banana types, including the establishment of a collection of varieties preliminary to selection and breeding experimentation; and other studies on the diseases, pests, culture, and productivity of bananas.

Zinc uses with various oil sprays, R. H. Smith and E. R. Parker (*Citrus Leaves, 15* (*1935*), *No. 9, p. 5*).—This contribution from the California Citrus Experiment Station reviews the authors' work on these sprays, with the conclusions that the investigation has not continued long enough to determine whether its mixture with oil reduces the efficiency of zinc oxide but that sufficient zinc is apparently absorbed by the leaves to cause recovery of citrus from mottle-leaf.

Progress report on Elgon dieback of coffee, C. A. Thorold (*East African Agr. Jour., 1* (*1935*), *No. 3, pp. 225–228*).—Representatives of several genera of fungi have been isolated from affected material, but none have been proved responsible. The author believes the disease to be essentially physiological in nature. The symptoms, conditions under which the die-back occurs, prevention, varietal resistance, and the program of the investigation are discussed.

Rust resistance in Antirrhinum, E. B. Mains (*Phytopathology, 25* (*1935*), *No. 11, pp. 977–991, figs. 2*).—In this study *Linaria canadensis*, *L. cymbalaria*, *L. dalmatica*, *L. pallida*, *L. purpurea*, *L. vulgaris*, *Adenostegia pilosa*, *Antirrhinum asarina*, *A. ibanjezii*, *A. maurandioides*, and *A. virga* proved highly resistant or immune to *Puccinia antirrhini* from snapdragon (*A. majus*). *A. orontium* was moderately resistant. *A. glutinosum*, *A. hispanicum*, *A. molle*, *A. nuttallianum*, *A. sempervirens*, *A. siculum*, and *A. tortuosum* showed marked differences between or within strains. *A. latifolium* and *A. valentium* were mostly susceptible, a few individuals showing resistance. *A. barrelieri*, *A. coulterianum*, *A. glandulosum*, and *A. vexillo-calyculatum* were uniformly susceptible. In *A. majus*, 47 commercial varieties tested were mostly very susceptible. A few selections showed slight resistance, and highly resistant strains were obtained from some of them by self-pollination and further selection. Highly resistant types were also obtained from crosses with resistant selections of *A. glutinosum* and *A. ibanjezii*. Resistance was found to be inherited as a simple dominant factor. It is stated that Emsweller and Jones (E. S. R., 71, p. 662) and White (E. S. R., 72, p. 783) have used certain of the resistant selections in crosses combining resistance with desirable commercial qualities.—(*Courtesy Biol. Abs.*)

Aster yellows and its control: A brief summary of the work of Dr. L. O. Kunkel in solving an important growers' problem, Z. Troy (*Florists Exch. and Hort. Trade World, 85* (*1935*), *No. 16, pp. 13, 17, figs. 3*; also in *Boyce*

Thompson Inst. Plant Res., Prof. Paper, 1 (1935), No. 28, pp. 262–266, figs. 3).—This is a summary of the published works of Kunkel from 1924 to 1932 on aster yellows, which has now been found in 50 plant species.

Dahlia diseases, R. P. White (*New Jersey Stas. Circ. 361 (1935), pp. 4*).—This is a popular account.

A cytological study of Puccinia malvacearum from the sporidium to the teliospore, R. F. Allen (*Jour. Agr. Res.* [*U. S.*], *51 (1935), No. 9, pp. 801–818, pls. 9*).—The results of this cooperative study between the U. S. D. A. Bureau of Plant Industry and the California Experiment Station are summarized as follows:

"*P. malvacearum* Bert. is a short-cycle rust of hollyhocks and mallows maintaining itself by repeated telial generations. Spermogonia, aecia, and uredia are unknown. Teliospores can germinate as soon as formed, giving rise to a promycelium bearing four binucleate sporidia. The sporidia germinate at once, and their germ tubes enter the leaf and give rise to uninucleate mycelium, which is both intercellular and intracellular. Nuclear locomotion incidental to vegetative growth and also the longer nuclear migrations during diploidization have been studied. In making a forward stride, a nucleus pushes out a long slender beak, then flows forward into the beak and condenses in the new position, leaving a temporary vacuole in the cytoplasm behind it.

"Hyphae reach both the upper and the lower surface of the host leaf by growing into stomata and by growing out through and, more rarely, between the other epidermal cells. There is some evidence that these surface hyphae produce small ovoid conidia about half the size of sporidia. The isolated monosporidial infection is retarded in growth and may die without developing a sorus.

"Whenever two monosporidial mycelia meet within the leaf, anastomoses form and a nuclear interchange takes place, followed by localized diploidization and the development of a sorus. Some hyphae are already diploid when they reach the sporogenous area of the sorus and can give rise directly to teliospores. Others are haploid and pair in the sorus before forming teliospores."

The transmission of Ceratostomella ulmi through root grafts, A. F. Verrall and T. W. Graham (*Phytopathology, 25 (1935), No. 11, pp. 1039, 1040, fig. 1*).—This is a report of field cases of transmission through root grafts between elm trees.

Dothidea noxia on American oaks [trans. title], W. Bavendamm (*Tharandter Forstl. Jahrb., 86 (1935), No. 4–5, pp. 273–275, fig. 1*).—This bark disease has hitherto been reported only occasionally on American species of oaks, but it now appears to be widely distributed on red oaks in Sachsen (Saxony), where serious damage is anticipated. Control measures are suggested.

A Phomopsis disease of conifers in New Zealand, T. T. C. Birch (*New Zeal. State Forest Serv. Bul. 7 (1935), pp. 30, figs. 18*).—A terminal wilt and stem canker of conifers in New Zealand is shown to be due to *P. strobi*, a fungus known in North America and Europe and probably introduced into New Zealand between 1927 and 1929. Since 1931 it has assumed economic importance as a parasite of exotic conifers.

The morphological characters of the New Zealand species of the genus are given in relation to other species on conifers, and the cultural characters of the New Zealand form of *P. strobi* are described. No ascigerous stage of the latter was found.

The relative pathogenicity of nine species of *Phomopsis* on conifers is noted. *P. strobi* occurs saprophytically on dead branches of a number of coniferous species throughout New Zealand, and in localities with severe, unseasonable frosts it parasitizes *Pinus radiata*, *P. muricata*, and *P. canariensis*, infection rarely occurring on trees over 10 yr. old. The fungus becomes parasitic during late winter and early spring when frosts coincide with the growing season of the susceptible species. Those commencing growth in the late spring (e. g., *P. ponderosa* and *P. murrayana*) are not attacked. That frost is a predisposing cause of the *Phomopsis* disease was experimentally proved. Subjected to from 22° to 24° F. for 1 hr. during the growing season, 8-year-old *Pinus radiata* trees became susceptible to infection, but negative results under similar conditions were obtained with *P. ponderosa* and *P. murrayana*.

Four types of infection are described, viz, terminal-shoot infection following frost injury, infection through snow injury, and two types of stem infection.

The differential characters of Cenangium abietis [trans. title], W. Bavendamm (*Tharandter Forstl. Jahrb., 86 (1935), No. 4–5, pp. 269–273, figs. 2*).—The author describes the characters of this bark disease of pine which differentiate it from the needle disease due to *Lophodermium pinastri*.

Rodents as a factor in reducing aecial sporulation of Cronartium ribicola, J. L. Mielke (*Jour. Forestry, 33 (1935), No. 12, pp. 994–1003, fig. 1*).—"White pine bark infected with the white pine blister rust is often fed upon by rodents of various kinds. Most of the feeding takes place during late winter or early spring, a time of year when food materials are naturally scarce. At some pine infection areas removal of the infected bark is so extensive as to result in a considerable reduction in volume of aeciospores, the spore stage which infects currants and gooseberries—the alternate host plants of the rust."

Some agencies attacking blister rust on white pine, E. E. Hubert (*Jour. Forestry, 33 (1935), No. 6, pp. 603–606, fig. 1*).—This is a review treating briefly of biological control in general, and more specifically of the effects of attacks on blister rust by other fungi, by insects, and by rodents. Special reference is made to published studies by the author and by European investigators on the purple mold *Tuberculina maxima* in control of blister rust. How important it may become in the United States is yet to be determined.

Blue stain development in peeled shortleaf and loblolly pine pulpwood, G. H. Hepting (*Paper Indus., 17 (1935), No. 6, pp. 402–404, figs. 4*).—In tests carried out by the Appalachian Forest Experiment Station, the proportions of sapwood stained did not vary appreciably between inside and outside bolts, between layers, or between different types of pens. This might appear to indicate that methods of piling have no effect on the development of blue stain, but they have been shown to have a great influence on this type of injury through their effect on the rate of drying. In this study the fullest pens apparently had almost as good a circulation of air as the most open ones, due to their small size and to the placing of the layers at right angles to each other. Over twice as much stain developed in the hand-peeled as in the machine-barked bolts.

Preliminary tests with one of the effective stain-preventive solutions on the peeled pulpwood gave promising results in control of blue stain.

Mill practices that influence the occurrence of sap stain in lumber, I. Hatfield (*South. Lumberman, 151 (1935), No. 1905, pp. 38–40, figs. 3; also in Amer. Lumberman, No. 3057 (1935), pp. 34, 35, figs. 5*).—As a result of investigations conducted since 1928, chemical treatments have been devised that are aiding southern manufacturers to produce lumber relatively free of sap stain. The detailed procedures recommended are discussed.

Seedling blight of Cinchona ledgeriana Moens caused by Phytophthora palmivora Butl. in the Darjeeling District, K. F. Kheswalla (*Indian Jour. Agr. Sci., 5 (1935), No. 4, pp. 485–495, pl. 1*).—Successful inoculations on the stems and leaves of cinchona proved the causal relation in a seedling blight of a *Phytophthora* agreeing pathologically and morphologically most closely with *P. palmivora*, of which it is considered to be a strain. The optimum temperature for growth was about 24° C., and at 35° growth ceased.

Scab of goldenrod caused by Elsinoë, A. E. Jenkins and H. G. Ukkelberg (*Jour. Agr. Res.* [*U. S.*], *51* (*1935*), *No. 6, pp. 515–525, pls. 7, fig. 1*).—Scab, a new disease of goldenrod, was discovered in June 1933 in experimental plats at Ft. Myers, Fla., and later found on wild plants in several Florida counties. The susceptible species noted are *Solidago chapmanii*, *S. edisoniana*, *S. elliottii*, *S. fistulosa*, *S. leavenworthii*, *S. mirabilis*, and *S. sempervirens*. The disease may cause death or stunting of young plants and produces characteristic scablike lesions on the leaves and stems of older plants. The causative organism is described as *E. solidaginis* n. sp., with a *Sphaceloma* conidial stage. Artificial inoculations gave positive results.

Spraying experiments with bordeaux mixture and lime-sulfur gave only partial control. Selection of host varieties for resistance is indicated as the most likely avenue of success in combating the disease.

The demonstration of plant-parasitic nematodes in host tissues, G. H. Godfrey (*Phytopathology*, *25* (*1935*), *No. 11, pp. 1026–1030, figs. 2*).—"The staining of plant-parasitic nematodes within the host tissues that results from treatment with Flemming's killing fluid is due to the reduction of the osmic acid by the fats and lipoids of the nematodes. Frequently the plant tissues become black as well, due to the contained reducing agents of one kind or another, and the nematodes are obscured. This is particularly true with green leaves and stems. This difficulty can be overcome by first treating the blocks of plant materials momentarily with hot, slightly dilute acetone, which kills the nematodes quickly in their natural position in the host tissues, then subjecting them to the extractive influence of the solution for 3 or 4 hr. This removes the chlorophyll and at the same time removes, at least in part, the lipoids and other reducing substances. The specimens can then receive the regular Flemming's treatment, followed by washing, dehydration in alcohols, and clearing, with excellent results in nematode differentiation."

A new variety of the bulb or stem nematode, Anguillulina dipsaci, and other variations in this species, G. Steiner (*Helminthol. Soc. Wash. Proc.*, *1* (*1934*), *No. 1, pp. 18, 19, fig. 1*).—The author describes and figures *A. dipsaci allocotus* n. v. from sod at Arlington, Va., and gives notes on other variations in the species.

New economic hosts of the stem- and bulb-infesting nematode, G. H. Godfrey and C. E. Scott (*Phytopathology*, *25* (*1935*), *No. 11, pp. 1003–1010, figs. 2*).—Salsify, parsley, and celery are reported as heretofore unrecorded food plant hosts of the nematode *Anguillulina dipsaci*. Symptoms in all were swollen leaf bases, "tulip root" effect in young shoots, yellowing and dwarfing, and some necrosis in the crown region. Hamburg parsley, in particular, was badly attacked. An additional symptom in parsley was a brown necrosis of the fleshy roots extending into both cortical and central regions, and leaflet invasion without distortion also occurred. In salsify and parsley the disease was found in plantings made for seed production in the vicinity of San Juan, Calif., in areas formerly in garlic in which the nematode disease was known to have been present. Diseased celery was not found in the field, but it was found in pot cultures following greenhouse inoculations with colonies of nematodes from garlic and parsley. Cross-inoculations showed the nematode strain or variety in these plants to differ distinctly from the alfalfa strain and the variety occurring in *Amsinckia intermedia*.

Survival and revival of Anguillulina dipsaci from narcissus material, G. W. Sherman (*Helminthol. Soc. Wash. Proc.*, *1* (*1934*), *No. 1, pp. 19, 20*).—

"Live *A. dipsaci* were found in bulbs hot-water-treated at 115° F. for 5 hr. and at 118° for 2 hr., in bulbs vapor-heat-treated [at] 116° for 6 hr., and in dried leaves vapor-heat-treated at 120° for 3 hr. Every case of survival proved to be the preadult stage."

Preadults from dried leaves revived well after 3 hours' treatment at 111.2°, which destroyed all but a small proportion of males and females from green leaves. Revival may require up to a week or more. The longer the drying the longer revival requires. Preadults may stand repeated dryings and revivals. Revival by soaking the bulbs prior to heat treatment was found to make the latter more effective.

Some experiments concerning the revival of quiescent Anguillulina dipsaci, W. D. Courtney and R. Latta (*Helminthol. Soc. Wash. Proc., 1 (1934), No. 1, pp. 20, 21*).—Since the hot water and vapor treatments are not 100 percent lethal to quiescent individuals, preliminary tests for the development of a method to revive such specimens before treatment are here reported. Vapor or hot water at from 70° to 80° F. induced activity, but revival depended considerably on the type of infestation and the conditions of the host bulb.

Observations on nematodes parasitic in tubers of the cinnamon-vine (Dioscorea batatas), G. Steiner (*Helminthol. Soc. Wash. Proc. 1 (1934), No. 1, pp. 15–17, fig. 1*).—Tubers of *D. batatas* from Japan, intercepted at Philadelphia, were infested with *Paraphelenchus amblyurus* n. sp., which is here described and figured.

Root-knot nematode in muck soils with reference to soil temperature and various treatments, J. D. Wilson (*Ohio Sta. Bimo. Bul. 178 (1936), pp. 21–25*).—*Heterodera marioni* is reported to be increasingly common in the Ohio muck areas, where considerable losses in celery and onions occur each year. Injury was more severe on onions in certain muck areas that had been treated with marl and clay than in adjacent, untreated areas, and the average soil reaction in the former case was pH 6.2 as compared with pH 5.3 in the latter. In heavily infested soils formaldehyde dust and sulfur reduced the amount of root knot on 6-week-old plants considerably below that in the control plats, whereas hydrated lime had but little effect. The respective soil reactions in these plats were pH 6.28, 4.98, 6.25, and 7.07. These facts at least suggest that an acid environment may be less favorable to the development of root knot than an alkaline one. Trials with dusts containing varying proportions of formaldehyde and carbon disulfide indicated the former constituent to be the more effective.

Temperatures of from 24° to 28° C. (75° to 82° F.) were the most favorable for the development of root knot on such plants as tomato, cucumber, lettuce, and celery, but it was more severe on onions at a somewhat lower temperature. Root knot was more common at temperatures above the optimum for host development than below it.

Potato eelworm disease, J. R. W. Jenkins (*Welsh Jour. Agr., 10 (1934), pp. 301–308*).—In view of the serious losses from nematodes in other parts of Great Britain and of their increasing spread in Wales (records given), the author gives a brief account of the life history of *Heterodera schachtii* and of the symptoms and control of the disease which it induces.

"Potato sickness" on allotments at New Romney, S. G. Jary and S. J. Travers (*Jour. Southeast. Agr. Col., Wye, Kent, No. 36 (1935), pp. 100–102*).—Records are given of one season's field tests (1934) with barnyard manure and with artificial fertilizers in preventing losses from eelworm (*Heterodera schachtii*) on potato-sick soil. The best results were obtained with the manure, but good seed seemed to have played some part when comparisons were made with the 1933 season. The artificial fertilizers failed to produce any increased yields.

The sugar beet nematode and other indigenous nemic parasites of shadscale, G. Thorne (*Jour. Agr. Res.* [*U. S.*], *51* (*1935*), *No. 6, pp. 509–514, figs. 3*).—The sugar beet nematode (*Heterodera schachtii*) is reported to be an indigenous parasite of shadscale (*Atriplex confertifolia*) in Utah. Though the shadscale is but little affected by the parasite, it is probably the source of many present infestations in sugar beet fields. *Anguillulina aberrans* n. sp. is shown to be a much more serious parasite of shadscale, causing swellings and galls on the roots, and, especially in dry seasons, it may cause the plant to die. *Neotylenchus latus* n. sp., a rare species inhabiting the cortex of the roots, causes no appreciable injury to the host.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Report of the Chief of the Bureau of Biological Survey, 1935, J. N. Darling (*U. S. Dept. Agr., Bur. Biol. Survey Rpt., 1935, pp. 51*).—The work of the year reported upon (E. S. R., 72, p. 500) includes data on the status and distribution of wildlife, including waterfowl, elk, and other big-game mammals, and the musk ox in Alaska; economic studies of wildlife, including investigations of waterfowl food resources, food habits of wildlife, relationships of predators and upland game birds, and field studies of crow-duck relationships and depredations of wild ducks, herons, and other birds; research in fur production, including the place of fur animals in the land program, progress in fur farming, feeding, and breeding experiments at the Fur Animal Experiment Station at Saratoga Springs, N. Y., and at the Rabbit Experiment Station at Fontana, Calif., and Karakul-fur investigations; disease control investigations, including fur animal losses and water pollution; land acquisition surveys and negotiations; migratory waterfowl restoration; wildlife refuge administration; conservation through law enforcement; importation and other permits issued during the year; and cooperative control of predators and rodents.

[Work in economic zoology and entomology by the Cornell Station] ([*New York*] *Cornell Sta. Rpt. 1935, pp. 76, 77, 94–96, 97–103*).—The work of the year (E. S. R., 72, p. 807) includes studies with deer of alfalfa hay, corn, oats, linseed meal, soybeans, and molasses, by L. A. Maynard and J. C. Woodward; nutritional requirements of the webbing clothes moth, by M. F. Crowell and C. M. McCay, and of trout, by McCay and A. V. Tunison; studies of clothes moths and carpet beetles, by G. W. Herrick and G. H. Griswold; control of *Adelges cooleyi*, by Herrick; the columbine borer and the iris borer, by Griswold, an account of which has been noted (E. S. R., 73, p. 356); the bark beetle *Scolytus multistriatus*, a transmitter of Dutch elm disease, by P. W. Claassen, P. A. Readio, D. S. Welch, K. G. Parker, and L. J. Tyler; relation of temperature to the rate of development of trout eggs, by G. C. Embody; forage minnow studies, by Embody and G. Trembley; effect of light in breaking the dormancy of mosquitoes, by R. Matheson and F. C. Baker; the wintering of bees, by E. F. Phillips; the effect of various bactericides on the longevity of honeybees used in fruit pollination, by Phillips and A. W. Woodrow; control methods for field mice in New York, by W. J. Hamilton, Jr.; and tarnished plant bug injury to celery, insects attacking potatoes on Long Island, millipede and gnat injuries to potato tubers, wireworms and their injuries to potato tubers, muck land potato spraying experiments, onion thrips, plant varietal resistance to insect injury, studies of the toxicity of sulfur and naphthalene to insects, and reactions of insects to radiant energy, all by G. F. MacLeod.

Game food and cover plants of the Lake States: Lake States Forest Experiment Station, compiled by P. L. Fisher, A. H. Briggs, W. A. Elkins, E. I. Roe, and C. M. Aldous (*U. S. Dept. Agr., Forest Serv., 1935, pp. [2]+81, pl. 1, figs. 2*).—This compilation of information on the game food and cover plants of the Lake States, presented in mimeotyped form, has been prepared as a source of information for field use. A list of 34 references to the literature cited and an index are included.

The formation and natural hue of the hair coat of wild mammals, K. Toldt (*Aufbau und natürliche Färbung des Haarkleides der Wildsäugetiere. Leipzig: Deut. Gesell. Kleintier- u. Pelztierzucht, 1935, pp. XII+291, pls. 6, figs. 227*).—Part 1 (pp. 16–96), deals with the formation of the hair coat of mammals, and part 2 (pp. 97–236) with the natural color of the fur at different depths. Some 200 colored illustrations and a 28-page classified list of references to the literature (pp. 243–270) are included.

Food preferences and requirements of the white-tailed deer in New York State, L. A. Maynard, G. Bump, R. Darrow, and J. C. Woodward (*N. Y. State Conserv. Dept. and Col. Agr. Bul. 1 (1935), pp. 35, figs. 5*).—This is a report of studies of the nutritive requirements of deer and of the value of various natural and artificial foods for use in the wild, undertaken with the object of developing a practicable method of overcoming the losses by starvation which occur in the Adirondacks during severe winters. The results of experiments at Willsboro (pp. 12–22) are followed by the details of physiological experiments conducted at Ithaca (pp. 23–31).

In summarizing the practical trial of concentrated food cakes and of alfalfa in west-central Hamilton County, the authors report that "as a whole the winter's experience with the cakes, consisting of soybeans and molasses, furnished convincing evidence of their usefulness as a supplementary food during the period of scarcity of natural food. It was found necessary to use browse at first to induce the deer to eat this strange food. Once started they ate it avidly. A 50-lb. cake was found to last eight deer nearly 2 weeks under average conditions. It became evident, however, that from the standpoint of facility of distribution the cake should not weigh in excess of 25 lb. Such a cake can easily be transported on a man's back, and yet is large enough to provide food for some time. While the alfalfa was readily eaten, the difficulties involved in transporting this bulky, less nutritious food compared to the cakes makes its use impracticable in any but the most easily accessible districts."

The laboratory studies at Ithaca have shown that growing deer will thrive on a ration of alfalfa hay and grain, and that they digest these foods just about as well as do goats of a similar age. The combination of hay and grain was found, by balance experiments, to provide protein satisfactory in quality for growth.

It was found from the Willsboro experiments that various species of browse, notably white cedar, yellow birch, and soft maple, will maintain animals in satisfactory weight and vigor during the winter months.

The results of a study of the normal composition of the blood of a 2-year-old male and of a mature female conducted over a 4-mo. period are reported in a table.

Bird flight, G. C. Aymar (*[New York]: Dodd, Mead [& Co.], 1935, pp. XII+234, [figs. 205]*).—The subject is dealt with under the headings of evolution (pp. 1–11), biology (pp. 12–84), migration (pp. 85–123), and aerodynamics (pp. 124–225). A bibliography of 40 titles and an index are included.

The eggs of Japanese birds, XI, K. Kobayashi and T. Ishizawa (*Rokko, Kobe, Japan: Keisuke Kobayashi, 1935, pp. [1]+129–144, pls. 8*).—A continuation of the work previously noted (E. S. R., 72, p. 805).

A study of the sharp-tailed grouse, L. L. Snyder (*Univ. Toronto Studies, Biol. Ser. No. 40 (1935), pp. 66, pls. 4, figs. 5*).—Part 1 of this contribution (pp. 7–35) reports upon the 1932 emigration of the sharp-tailed grouse (*Pedioecetes phasianellus phasianellus*), which took place in parts of northern Ontario and Quebec, and related topics. Part 2 (pp. 36–64) reports upon a preliminary taxonomic study of the genus *Pedioecetes*. A list is given of 39 references to the literature cited.

Food habits of common hawks, W. L. McAtee (*U. S. Dept. Agr. Circ. 370 (1935), pp. 36, figs. 17*).—An introduction and discussions of the economic value of the prey of hawks, attitude toward predators, and groups and species of hawks are followed by accounts of the distribution, recognition, results of stomach content analyses, and status of 17 common hawks.

Evidence obtained from the examination of 5,185 stomachs has led to a grouping as regards their economic tendencies. It is concluded that Swainson's hawk, the American rough-legged hawk, and the sparrow hawk are almost entirely beneficial; the red-shouldered hawk, broad-winged hawk, and the ferruginous roughleg are preponderantly beneficial and seldom in need of control; the red-tailed hawk and golden eagle are more beneficial than injurious, being at times subject to control; the marsh hawk and prairie falcon appear to be neutral, being possessed of harmful and beneficial habits in about equal proportion; the bald eagle and osprey are ordinarily neutral but sometimes injurious; the pigeon hawk may be tolerated in small numbers but not in abundance; while the goshawk, sharp-shinned hawk, Cooper's hawk, and the duck hawk are species of which but little can be said in their favor.

Control of [fish] hatchery diseases, G. C. Embody, D. G. Pasko, P. I. Tack, D. D. Moss, and L. M. Thorpe (*[New York] Cornell Sta. Rpt. 1935, p. 96*).—Tests with various drugs are noted.

The location of olfactory receptors in insects: A review of experimental evidence, J. Marshall (*Roy. Ent. Soc. London, Trans., 83 (1935), No. 1, pp. 49–72*).—This review is presented with a 6-page list of references to the literature.

Insects in relation to production of red clover seed, J. H. Bigger (*Seed World, 38 (1935), No. 10, pp. 8, 9, 30, figs. 2*).—A practical contribution from Illinois.

[Contributions on economic insects and insect control] (*5. Cong. Internatl. Ent., Paris, 1932, II, Trav., pp. 33–63, 79–96, 101–108, 161–171, 209–220, 243–255, 289–302, 309–312, 345–360, 407–422, 461–468, 471–546, 557–572, 585–698, 711–812, 823–845, 855–872, 879–900, pls. 15, figs. 46*).—Among the contributions presented at the Fifth International Congress of Entomology (E. S. R., 63, p. 845), held at Paris in July 1932, are the following:

Attempts to Disprove the Theories of Warning Colours, Mimicry, and Protective Resemblances in Insects, by E. B. Poulton (pp. 33–44); Recent Advances in Applied Entomology in Canada, by A. Gibson (pp. 45–63); The Biology of *Ceroplastes floridensis* Comst. and the Geographical Distribution of *Ceroplastes* in the Palearctic Region (Hemiptera: Coccidae) [trans. title], by A. Balachowsky (pp. 79–87); Factors Influencing Fluctuations of *Icerya purchasi* Mask. and of *Novius cardinalis* Muls. [trans. title] (pp. 89–91) and Sense Ecology, a Neglected Factor in Insect Epidemiology (pp. 93–96), both by F. S. Bodenheimer; The Primary Larvae of Meloidae [trans. title], by A. Cros (pp. 101–108); The Present Status of Entomo-physiological and -toxicological Studies in the U. S. S. R. [trans. title], by N. J. Kusnezov (pp. 161–171); Immunity in Insects [trans. title], by S. Metalnikov (pp. 209–220); Contribution to the Classification of the Palearctic Tachinariae [trans. title], by J. Villeneuve de Janti (pp. 243–255); Experiments on the Mode of Action of

Pyrethrum and Its Effects on Insect Tissues, by A. Hartzell and F. Wilcoxon (pp. 289–294); Investigations on the Ecology and Physiology of *Anthrenus fasciatus* Herbst [trans. title], by A. Herfs (pp. 295–302); Some Experiments on the Venomous Properties of *Latrodectus menavodi* Vinson (Madagascan Spider) [trans. title], by L. Lavauden (pp. 309–312); Experiments on the Respiration of Aquatic and Parasitic Insect Larvae, by W. H. Thorpe (pp. 345–351); Conditioned Reflexes in Insect Behaviour, by B. P. Uvarov (pp. 353–360); Some Fundamental Aspects of Insect Parasitism, by C. H. Kennedy (pp. 407–419); A Summary Note on the Biology of *Urania ripheus* (a Madagascan Lepidopteran [trans. title], by L. Lavauden (pp. 421, 422); Geographic and Ecologic Factors in Distribution of Neotropic Homoptera, by H. Osborn (pp. 461–468); Peculiarities of the Coleopterous Fauna of Semiarid Southwestern North America, by E. C. Van Dyke (pp. 471–477); A New Injury to the Date in Egypt by the Cixiid Bug *Ommatissus binotatus* Fieber var. *libycus* Berg. [trans. title], by A. Alfieri (pp. 479–482); The Cotton Leaf Worm (*Alabama argillacea* Hubner) in Haiti [trans. title], by A. Audant (pp. 483–487); The Insecticide Action of Tobaccol [trans. title], by N. A. Barbieri (pp. 489–493); An Entomological Consideration of the Principal Crops of Italian Somaliland [trans. title], by A. Chiaromonte (pp. 495–514); Taxonomy and Biological Control [trans. title], by C. Ferrière (pp. 515–518); Symptomatic Detection of Plant Pests—Its Importance in the Training of Agricultural, Horticultural, and Forestry Students, by G. Fox Wilson (pp. 519–528); A New Method for the Biological Investigation of Larvicides Employed in Combating *Eulecanium corni* Bouché and Other Coccids Which Excrete Honeydew [trans. title], by M. Gradojevic (pp. 529–532); The Oriental Fruit Moth (*Grapholitha molesta* (Busck)) and Its Parasites in France and Italy, by G. J. Haeussler (pp. 533–537); The Protective Action of Eulan on Woolens Treated for Clothes Moths [trans. title], by A. Hase (pp. 539–546); Review of Five Seasons' Work in Louisiana in Controlling the Sugar-Cane Moth Borer by Field Colonizations of Its Egg Parasite *Trichogramma minutum* Riley, by W. E. Hinds (pp. 557–572), contributed from the Louisiana Experiment Station; Three Rare Lepidopterous Parasites of Coccids, by S. Mahdihassan (pp. 585–588); Barium Fluosilicate as an Insecticide [trans. title], by E. Malenotti (pp. 589–610); The Role of Micro-organisms in the Destruction of Noxious Insects [trans. title], by S. Metalnikov (pp. 611–616); The Locust Problem in Egypt, by A. M. Mistikawy (pp. 617–625); The Combat of the Grasshopper *Dociostaurus maroccanus* Thnb. in the Province of Roma (Rome) in 1932 [trans. title], by G. Garavini and G. Paoli (pp. 627–632); Observations on the Biology of *Dociostaurus maroccanus* Thnb. in Italy in Its Gregarious and Solitary Phases and the Effect of Some Insect Parasites [trans. title], by G. Paoli (pp. 633–643); Contribution to a Study of the Role of Insects in the Propagation of the Canker of Poplars [trans. title], (pp. 645–650) and Some Effects of the Feeding of *Aphrophora salicis* De Geer on the Wood of Willows [trans. title] (pp. 651–654), both by R. Régnier; Some Recent Work in England on Pests of Stored Products, by O. W. Richards (pp. 655–658); Economic Entomology and Agricultural Practice, by W. R. Thompson (pp. 659–665); Physiological Basis of Applied Entomology, by B. P. Uvarov (pp. 667–678); An Outbreak of the European Fruit Lecanium (*Lecanium corni*) in the Plum Orchards of Yugoslavia—Preliminary Studies of the Scale and Means of Control [trans. title], by P. Voukassovitch (pp. 679–691); The San Jose Scale (*Aspidiotus perniciosus*) and Its Outbreak in Europe [trans. title], by B. Wahl (pp. 693–698); A Fatal Myiasis of the Young Ramier Pigeon (*Columba palumba* L.) [trans. title], by H. Heim de Balsac (pp. 711, 712); The Phytophagy of Larvae of *Phlebotomus papatasi* [trans. title], by L. Parrot (pp. 713, 714); Experiments on the Trophic and Biologic Races of *Anopheles* *maculipennis* [trans. title], by E. Roubaud (pp. 715–733); Notes on Mosquitoes [trans. title], by G. Senevet (pp. 735–741); Some Observations on the Biology of the Ceratopogoninae of Algeria [trans. title], by E. Sergent, L. Parrot, and A. Donatien (pp. 743–746); Injuries Caused by Termites of Indochina to Living Vegetation and to Finished Wood, and Remedial Measures [trans. title], by J. Bathellier (pp. 747–750); A Serious Enemy of Maritime Pine (*Dioryctria splendidella*) [trans. title], by J. Feytaud (pp. 751–755); Some Aspects of the "*Lyctus*" Powder-Post Beetle Problem in Great Britain, by R. C. Fisher (pp. 751–771); Role of the Ipidae in the Destruction of Vegetation in the Belgian Congo [trans. title], by J. Ghesquière (pp. 773–787); The Enemies of *Picea omorica* Pančić, a Conifer Native to Yugoslavia [trans. title], by M. Gradojević (pp. 789, 790); Wood-Attacking Coleoptera of the Forest of Fontainebleau [trans. title], by F. Gruardet (pp. 791–800); Problems of Forest Entomology in the Netherlands East Indies, by L. G. E. Kalshoven (pp. 801–805); The Biological Combat of *Lymantria dispar* in Morocco by *Schedius kuvanae* [trans. title], by J. de Lépiney (pp. 807–812); Report on the Activity of the Apicultural Research Center at Guebwiller in Alsace [trans. title], by A. Baldensperger (pp. 823–828); Varieties of the Honey Bee in North Africa [trans. title], by P. J. Baldensperger (pp. 829–839); Losses in Hives Caused by the Larvae of Meloidae [trans. title], by A. Cros (pp. 841–845); Apiculture in Spain [trans. title], by M. de la Escalera (pp. 855–864); Pastoral Apiculture [trans. title], by E. Fankhauser (pp. 865–872); Temperature in the Bee Hive, by D. Morland (pp. 879–881); Effect of Weather Upon Colony Gains in Weight During Goldenrod Honey Flows, by E. Oertel (pp. 883–891); and Apicultural Organization and Legislation in Italy [trans. title], by A. Zappi Recordati (pp. 893–900).

[Contributions on economic insects and their control] (*Mass. Fruit Growers' Assoc. Rpt., 41 (1935), pp. 65–68, 73–78, 141–145*).—Contributions presented at the annual convention of the association (E. S. R., 72, p. 358) held at Worcester, Mass., in January 1935, include the following: Insect Pest Problems and Solutions in the Northeast (pp. 65–68) and New Developments in Dormant Spray Programs (pp. 73–78), both by P. J. Parrott; Fruit Insect Pests in Massachusetts Orchards in 1934, by A. I. Bourne and W. D. Whitcomb (pp. 141–143); and Report of Committee on Diseases and Insect Pests, by A. I. Bourne (pp. 144, 145).

[Contributions on economic insects] (*Trudy Din. Razv. [Moskva] (Trans. Dyn. Devlpmt.), 10 (1935), pp. 385–412*).—The contributions here presented include the following: The Influence of Temperature Upon the Development of Larvae of *Musca domestica*, by Kh. Kobaiiāshi (H. Kobayashi) (pp. 385–395, Russ. abs. p. 395); On the Duration of Life and Food Consumption of Bees Under Different Density of Population, by N. I. Kalabukhov (N. Kalabukhof) (pp. 397–402, Eng. abs. p. 402); and The Influence of Alcohol on Development and Reproduction in Insects, by S. Kopet͡s (Kopeć) (pp. 403–412, Russ. abs. p. 412).

Annual report of the entomologist for 1934, H. M. Morris (*Cyprus Dept. Agr. Ann. Rpt., 1934, pp. 39–44*).—The work of the year with insect pests and silkworms is reported upon (E. S. R., 72, p. 655).

Sixty-fifth annual report of the Entomological Society of Ontario, 1934 (*Ent. Soc. Ontario Ann. Rpt., 65 (1934), pp. 136, figs. 11*).—The contributions in this report (E. S. R., 73, p. 205), issued in 1935, include the following: The Grasshopper Outbreak in Saskatchewan, by K. M. King and S. H. Vigor (pp. 5–21); The Influence of Cultural Practices on Field Crop Insects, by H. L. Seamans (pp. 22–28); The Influence of Cultural Practices on Garden and Vegetable Insects, by A. G. Dustan (pp. 28–36); The Influence of Cultural Practices on Garden, Field, and Vegetable Crop Insects, by R. P. Gorham (pp. 36–40); The Influence of Cultural Practices on Orchard Insects, by L. Caesar, J. A. Hall, and A. Kelsall (pp. 40–42); The Influence of Cultural Practices on Tree Fruit Insects in British Columbia, by E. R. Buckell (pp. 42, 43); Cultural Practices and Forest Insects, by R. E. Balch (pp. 43–49); The European Pine Shoot Moth in Connecticut, by R. B. Friend (pp. 50–54); Notes on the Alfalfa Snout Beetle *Brachyrhinus ligustici* L., a New Insect Pest in New York State, by C. E. Palm (pp. 54–58) (E. S. R., 74, p. 74); Some Stored Product Pests in Canada, With Special Reference to the Hairy Spider Beetle (*Ptinus villiger* Reit.), by H. E. Gray (pp. 59–68); Parasites of the Oriental Fruit Moth (*Laspeyresia molesta* Busck) in Ontario—A Summary, 1932–33–34, by W. E. van Steenburgh (pp. 68–72); Biological Control of Greenhouse Insects, by A. B. Baird (pp. 72, 73); The Iron Sulphate and Lime-Sulphur Mixture (pp. 73–76) and An Improved Form of Arsenious Oxide as an Insecticide (pp. 76–78), both by A. Kelsall; Indices of Toxicity for Various Poisons to *Drosophila ampelophila* Loew, by N. A. Patterson (pp. 78–80); Warble Fly [Common Cattle Grub] Control in Ontario, by L. Stevenson (pp. 81–83); The Turnip Aphid Outbreak in Ontario (pp. 84, 85) and The Corn Borer Situation in Ontario in 1934 (pp. 85–87), both by L. Caesar; The Grasshopper Campaign in Manitoba in 1934, by A. V. Mitchener (pp. 87–89); Aphids in New Brunswick Potato Fields in 1934, by R. P. Gorham and J. C. Burnham (pp. 89, 90); Precautions Taken to Prevent the Importation of Pests and Diseases on Exhibits for the World's Grain Exhibition, Regina, 1933, by L. S. McLaine (pp. 90–93); Coleopterous Collections From Japanese Beetle Traps in Southern Ontario, by R. W. Sheppard (pp. 93–97); Observations on the Flight of Adults of the Genus *Crambus*, With Special Reference to the Economic Species, by D. A. Arnott (pp. 98–107); Some Observations on the Grape Berry Moth, by W. G. Garlick (pp. 108–112); A Summary of Insect Conditions in Canada in 1934, by C. R. Twinn (pp. 112–128); and Correction of 64th Report, 1933 (p. 129).

Administration report of the entomologist, Burma, for the year ending 31st March 1935, C. C. Ghosh (*Burma Dept. Agr. Rpt., 1935, pp. 41–47*).—A brief account of the occurrence of and work of the year with economic insects.

Annual report of the Government entomologist for the year 1934, H. W. Simmonds (*Fiji Dept. Agr. Ann. Bul., 1934, pp. 12–16*).—The occurrence of and work of the year with crop pests and insects injurious to man are briefly reported upon (E. S. R., 73, p. 808).

Division of entomology: Annual report for the year 1934, G. H. Corbett (*Straits Settlements and Fed. Malay States Dept. Agr., Gen. Ser. No. 21 (1935), pp. 43–56*).—The occurrence of and work of the year with insects infesting crops and stored products are reported upon.

Report of the Chief of the Bureau of Entomology and Plant Quarantine, 1935, L. A. Strong (*U. S. Dept. Agr., Bur. Ent. and Plant Quar. Rpt., 1935, pp. 1–5, 8–31, 36–41, 44–65*).—The research and control work of the year ended June 30, 1935 (E. S. R., 72, pp. 652, 653), is reported upon.

Fruit and nut insect work includes codling moth control by the use of insecticides, sanitation and banding, bait traps, and parasites; the plum curculio on peaches; San Jose scale; oriental fruit moth; grape berry moth; grape leafhopper; pecan nut casebearer; leaf casebearer (*Acrobasis palliolella* Rag.); obscure scale; raisin moth (*Ephestia figulilella* Greg.); dried-fruit beetle; citrus rust mite; fruitflies, including the Mediterranean fruitfly, the Mexican fruitfly, and related forms of *Anastrepha* (*A. serpentina* Wied. and *A. acidusa* Walk.); the date scale; the Japanese beetle; Asiatic garden beetle (*Autoserica castanea* Arr.); and the Asiatic beetle.

Insects attacking forest and shade trees referred to include the mountain pine beetle, the western pine beetle, and other bark beetles; the locust borer; southern pine beetle; white pine weevil; beech coccus; larch casebearer; leaf-mining sawfly; elm leaf beetle; balsam bark louse; smaller European elm bark beetle (*Scolytus multistriatus* Marsh.); native elm bark beetle (*Hylurgopinus rufipes* Eichh.); gypsy moth; brown-tail moth; and the satin moth.

Cereal and forage crop insects referred to include grasshoppers; the chinch bug; the European corn borer; alfalfa aphid; white grubs; the hessian fly; hairy vetch bruchid; corn flea beetle, which transmits Stewart's disease, and a flea beetle (*Chaetocnema denticulata* Ill.) and a pollen feeder on corn (*Stilbus apicalis* Melsh.), from which the causative organism has been cultured; corn earworm; and flour beetles.

Truck crop, garden, greenhouse, and bulb insects mentioned include wireworms, particularly the Gulf wireworm; Mexican bean beetle; pea aphid; beet leafhopper; tobacco flea beetle; tobacco hornworm; cigarette beetle; tobacco moth; raspberry fruitworm; red berry mite; strawberry weevil; pepper weevil; iris thrips; Mexican mealybug; gladiolus thrips; and the greater bulb fly.

Cotton insects reported include the bollweevil; pink bollworm; cotton flea hopper; aphids attacking roots of cotton, especially the corn root aphid, *Trifidaphis phaseoli* Pass., and *Rhopalosiphum* sp.; and the Thurberia weevil.

Insects affecting man and animals noted include the screwworm, horse botfly, stablefly, Australian cattle tick (*Margaropus annulatus australis* Fuller), blackfly or buffalo gnat (*Simulium* sp.), mosquitoes, sand flies, and blowfly maggots, with a brief reference to household and stored-product insects.

Data on bee culture include pollination of fruit trees, cost of honey production, beeswax, poisoning of bees by locoweed and matilija poppy, foulbrood control, and loss of package bees and queens in transit.

The work of foreign parasite introduction relates to parasites of the oriental fruit moth, Japanese and Asiatic beetles, European corn borer, pink bollworm, alfalfa weevil, hessian fly, European pine shoot moth, larch casebearer, birch leaf miner, and elm leaf beetle.

Insecticide control studies include the use of hydrogenated naphthalene as a fumigant against clothes moths, a survey of the insecticidal value of domestic species of rotenone-bearing plants, the insecticidal effect of derris and pyrethrum dusts and alcoholic extracts of pyrethrum, the use of organic compounds against mosquito larvae, the fumigation of sweetpotatoes for seed with paradichlorobenzene, the gelatine-film method for testing insecticides, the effect of low temperatures on larvae of the cigarette beetle, the relative toxicity of arsenates of calcium, and sterilizing rice straw by heat. Insecticide investigations dealt with anabasine in the leaves and roots of the tree tobacco (*Nicotiana glauca*), derris and rotenone sources, nicotine peat, pyrethrum, phenothiazine and phenothioxin, oil emulsions, concentrations of hydrocyanic acid gas, spray residues, calcium arsenate, and accessory materials used to improve the stability or ease of application of insecticides.

[Report of work with economic insects and insect control] (*New York State Sta. Rpt. 1935, pp. 43, 44, 51–54, 55–61*).—The work of the year referred to (E. S. R., 72, p. 654) includes studies of calcium arsenate; spreading and wetting agents; the codling moth; tar distillate sprays; the fruit tree leaf roller; the white apple leafhopper; apple redbug; apple maggot; influence of artificial light on codling moth infestation, an account of which has been noted (E. S. R., 73, p. 75); biological control investigations of the oriental fruit moth, particularly by *Macrocentrus ancylivorus*, of the codling moth by *Ascogaster carpocapsae*, and of the rosy apple aphid and pea aphid by the convergent ladybeetle; the peach borer, lesser peach borer, and shot hole borer as enemies of peach; several nursery and ornamental insect pests, including the spruce gall aphid *Adelges abietis*, a report relating to which has been noted (E. S. R., 73, p. 74), the strawberry root weevil, and the gladiolus thrips; the pea aphid as a canning crop pest; control of the cabbage aphid and cabbageworm in western New York; and the corn earworm, cabbageworm, and potato insects on Long Island.

[Report of work in entomology by the Arkansas Station] (*Arkansas Sta. Bul. 323 (1935), pp. 33–35*).—A brief report is made of the occurrence and work of the year 1934–35 (E. S. R., 72, p. 806) with several enemies of shade trees, namely, the great elm leaf beetle *Monocesta coryli*, the catalpa sphinx, and the eastern tent caterpillar, and the strawberry crown moth, both by W. J. Baerg; the southern buffalo gnat *Eusimulium pecuarum* (Riley) and the autumn horsefly *Tabanus sulcifrons* Macq., both by H. H. Schwardt; codling moth control, by D. Isely and Schwardt; and the cotton bollworm, by Isely.

Observations on the control of insects by hand-collection, R. H. Le Pelley (*Bul. Ent. Res., 26 (1935), No. 4, pp. 533–541, figs. 3*).—This contribution relates particularly to an experimental study of hand collection for the control of *Antestia orbitalis lineaticollis* Stål in Kenya. Details of a thorough long-continued attempt to control *Antestia* on 35 acres of coffee by hand picking are given.

The results are considered to show that in theory 100 percent of the insects can never be obtained by hand picking, and that in practice the cost of picking an adequate percentage is almost invariably prohibitive. It is probable that the experimental results obtained will prove valid in other cases of hand picking. Much of the expenditure on this method is unproductive.

A mechanical insect trap, C. B. Williams and P. S. Milne (*Bul. Ent. Res., 26 (1935), No. 4, pp. 543–551, pl. 1, figs. 2*).—A description is given of an electro-mechanical insect trap developed at the Rothamsted Experimental Station. This trap consists essentially of two long conical muslin nets fastened to the ends of a light framework, about 12 ft. in diameter, which is free to rotate and which can be raised and lowered so that the distance of the nets from the ground can be altered. In the mouth of each net is an electric fan which drives a rapid current of air into the net and at the same time pulls the net forward so that the whole framework rotates horizontally round the central axis.

A water-power mechanical insect trap, W. M. Davies (*Bul. Ent. Res., 26 (1935), No. 4, pp. 553–557, pl. 1, figs. 3*).—An illustrated description is given of a mechanical insect trap based upon that perfected by Williams and Milne, above noted, and adapted to be driven by water power.

Derris (tuba root), compiled by D. H. Grist (*Malayan Agr. Jour., 23 (1935), No. 10, pp. 477–482*).—A summary of information on derris, with a list of 16 references to the literature.

Plant fish poisons as insecticides, R. M. and A. L. Whittaker (*Poultry Sci., 14 (1935), No. 6, pp. 351–354*).—In this article the authors have attempted to collect from the literature on rotenone and similar substances all of the facts most interesting to the practical as well as to the research poultryman.

Parasites and parasitism, P. P. Grassé (*Parasites et parasitisme. Paris: Libr. Armand Colin, 1935, pp. 224, figs. 26*).—This small handbook includes much information on insect parasites.

Agriculture versus insects, E. Malenotti (*L'Agricoltura contro gli insetti. Roma: Ramo Ed. Agr., 1935, pp. 323, figs. 44*).—A practical account on the resistance of plants to and control measures for crop pests, presented with a list of 201 references to the literature.

Insects injurious to alfalfa in Kansas, G. A. Dean and R. C. Smith (*Kans. State Bd. Agr., Bien. Rpt., 29 (1933–34), pp. 202–249, figs. 40*).—This contribution from the Kansas Experiment Station is a revision of one prepared by the senior author in 1916 (E. S. R., 36, p. 152).

[Contributions on fruit insects and their control] (*Amer. Pomol. Soc. Proc., 49 (1933), pp. 19–40*).—The contributions presented at the annual meeting of the American Pomological Society in joint session with the Illinois State Horticultural Society at Springfield, Ill., in December 1933 include the following: The Present Status of Oil Sprays, by M. D. Farrar (pp. 19–25); Codling Moth Experiments During 1932–1933, by W. P. Flint (pp. 25–34), contributed from the Illinois Experiment Station; and Codling Moth Control, by B. A. Porter (pp. 34–40).

[Contributions on fruit insects and their control] (*Va. State Hort. Soc. Rpt., 40 (1935), pp. 113–118, 139–142, 155–159, figs. 2*).—Contributions presented at the annual meeting of the Virginia State Horticultural Society held at Roanoke, Va., in December 1935 include the following: Biological Control of the Oriental Peach Moth and the Apple Leafhopper, by W. J. Schoene (pp. 113–118); Comstock's Mealy Bug in Virginia Apple Orchards, by A. M. Woodside (pp. 139–142); and Present Status of the Rosy Apple Aphid and Its Control, by W. S. Hough (pp. 155–159), contributed from the Virginia Experiment Station.

The control of the insect pests of basket willow, with special reference to the use of combined insecticidal and fungicidal washes and to methods of application, H. G. H. Kearns (*Univ. Bristol. Agr. and Hort. Res. Sta., Long Ashton, Ann. Rpt., 1934, pp. 126–146*).—In this contribution the life history and biology of the principal insect enemies of basket willow are outlined, and the value of the principal insecticides and fungicides so far as they refer to willow pests is considered.

Key for the identification of important forest insect pests, M. Nunberg (*Klucz do oznaczania ważniejszych szkodliwych owadów leśnych. Warszawa (Warsaw): Inst. Badaw. Lasów Państ., 1935, pp. 288, figs. 359; rev. in Jour. Forestry, 33 (1935), No. 11, pp. 949, 950*).—An illustrated key for the identification of the more important insect enemies of pine, spruce, fir, larch, oak, beech, ash, elm, maple, birch, hornbeam, poplar, linden, alder, and willow.

The economic possibilities of aeroplane dusting against forest insects, I. Trägårdh (*Bul. Ent. Res., 26 (1935), No. 4, pp. 487–495, figs. 2*).—A survey of the dusting operations carried on against forest insects in Europe during the period 1925–34, the danger of calcium arsenate dusting to the fauna of the forest, and modern efforts to replace calcium arsenate by contact poisons are considered, followed by a comparison of the different methods of dusting.

The respiration of insects in relation to the heating and the fumigation of grain, D. L. Lindgren (*Minnesota Sta. Tech. Bul. 109 (1935), pp. 32, figs. 15*).—The first part of this bulletin (pp. 3–19) considers the relation of insect respiration in grain to heat and moisture production.

It is concluded that "both the rice and the granary weevil have certain moisture requirements, but those of the granary weevil seem to be lower than those of the rice weevil. If there is insufficient moisture present, the metabolic rate decreases, finally resulting in the death of the organism. If the moisture present is sufficient or more than sufficient (all other factors being constant), the metabolic rate remains fairly uniform.

"Temperature has a decided effect on the rate of respiration of the species of weevils worked with. Of the temperatures used, the insects were the most active at 35° C. Progressing either way from this temperature the carbon dioxide production falls considerably.

"If moisture conditions of the wheat are favorable, the rice weevil respires more than the granary weevil, weight for weight, but if individual weevils are compared, the granary weevil has the higher rate of respiration.

"Grain infested with insects probably will tend to go 'out of condition' much sooner than uninfested grain. The metabolic water and heat given off by the insects no doubt hasten this process and may even initiate it."

Part 2 (pp. 20–30) takes up the relation of insect respiration to the toxicity of fumigants. Comparative studies of the rate of respiration and the susceptibility to fumigants were made of three species of stored product insects, namely, the confused flour beetle, the rice weevil, and the granary weevil. It was found that while the confused flour beetle has the highest rate of respiration, it is the most resistant to carbon disulfide and ethylene oxide. The relationship between toxicity and rate of respiration holds fairly well for the rice weevil and the granary weevil.

"Studies similar to the above were carried out on the four stages of the confused flour beetle. From the data presented it seems there is no definite relationship between the rate of respiration of the different stages of an insect and their susceptibility to fumigants.

"In comparing the susceptibility of insects or their stages to fumigants, the rate of respiration is not the only factor to take into consideration. Within a given stage any extrinsic factor that may tend to increase the rate of metabolism of that stage may also tend to increase the susceptibility of it to fumigants. This is shown by the effect of temperature on both the rate of respiration and the susceptibility of adult insects to fumigants."

A list is given of 35 references to the literature.

The biology of mayflies, with a systematic account of North American species, J. G. NEEDHAM, J. R. TRAVER, Y. C. HSU, ET AL. (*Ithaca, N. Y.: Comstock Pub. Co., 1935, pp. [XVI]+759, pls. [41], figs. 168*).—Part 1 of this work deals with mayflies in general (pp. 1–236), part 2 with North American mayflies—a systematic account of North American species in both adult and nymphal stages (pp. 237–739). Practical analytical keys of the eggs of North American mayflies, of the families, subfamilies, genera, groups of species, and gills of nymphs are included.

Our enemy the termite, T. E. SNYDER (*Ithaca, N. Y.: Comstock Pub. Co., 1935, pp. XII+196, pls. 11, figs. 56*).—This contribution on the biology and control of the termites native to the United States is based upon observations in the field and information gained from a study of artificial colonies in the laboratory while engaged in work with the U. S. D. A. Bureau of Entomology and Plant Quarantine extending over a period of 26 yr. Information relating to city building codes for insuring protection against termites and decay appears in an appendix. A table (by families) of the Isoptera or termites of the world, a classified list of the termites of the United States, and a tabulated classification of termite guests or inquilines are given in addenda. A glossary of technical terms and an index are included.

Phase variation in non-swarming grasshoppers, I. A. RUBTZOV (*Bul. Ent. Res., 26 (1935), No. 4, pp. 499–520, pls. 2, figs. 2*).—The data here presented suggest that the inheritable variations inside the species, following the law of homologous series and the individual phase variability, as defined by Uvarov (E. S. R., 61, p. 64), do not contradict each other and are found probably in all the Acrididae, though in different degrees. "The degree of phase variability is very different according to the species and varies from the striking structural and biological transformation in *Locusta migratoria* L. to the small, but wholly analogous, changes in nonswarming grasshoppers. The degree of phase variability is directly connected with the possibilities for a given species or race to develop in a restricted space in numbers exceeding those which can find sufficient food in the place of hatching. We believe that this explains both the origin and the biological meaning of the phase variability, which can be regarded as a special adaptation."

Rhythm, synchronism, and alternation in the stridulation of Orthoptera, B. B. Fulton (*Jour. Elisha Mitchell Sci. Soc., 50 (1934), No. 1–2, pp. 263–267*).—This is a contribution from the North Carolina Experiment Station.

Proceedings of the Third International Locust Conference, London, September 18, 1934 (*London: Govt., 1934, pp. 184, pls. 2, figs. 6*).—Following a brief report of the proceedings of the third conference, of which the first has been noted (E. S. R., 46, p. 853), information is presented in 23 appendixes. The report is in both English and French and the appendixes are in either English or French.

Thrips investigation.—VII, On the effect of temperature and food upon egg production and the length of adult life of Thrips imaginis Bagnall, H. G. Andrewartha (*Jour. Council Sci. and Indus. Res.* [*Aust.*], *8 (1935), No. 4, pp. 281–288, figs. 2*).—In the studies at Melbourne here reported (E. S. R., 73, p. 649) it was found that no eggs of *T. imaginis* "were laid below about 8.5° C. At higher temperatures the total number of eggs laid was not affected by temperature, but the rate of egg production was proportional to the temperature.

"The insects lived for a much longer period at the low than at the higher temperatures; the mean length of life of females at 23° was 45.7 days compared with 251.3 days at 8°. Males lived as long as females at 8°, but had shorter life at 23° (males 31.5 days, females 45.7 days).

"Food was found to play an important part in the production of eggs. Without pollen, egg production did not proceed normally. Probably it is the protein content of the pollen which makes it so necessary. The stamen of *Antirrhinum* (with the anther removed) contained sufficient protein to support life, but not sufficient to enable normal egg production to proceed. When the leaf tissue of *Plantago lanceolata* or *Trifolium repens* was the only food available, the length of life was reduced and no eggs were produced."

The genus Aptinothrips Haliday (Thysanoptera: Terebrantia), E. R. Speyer (*Roy. Ent. Soc. London, Trans., 83 (1935), No. 4, pp. 483–508, pl. 1, figs. 29*).—A discussion of the taxonomy of the genus *Aptinothrips* represented by five species, their habitat and distribution, etc., is here presented.

Contributions towards a knowledge of the Thysanoptera of Egypt, X, H. Priesner (*Bul. Soc. Roy. Ent. Égypte, 28 (1935), pp. 315–325, figs. 5*).—A continuation of this contribution (E. S. R., 72, p. 659) in which one species of *Aeolothrips*, one of *Taeniothrips*, one of *Trehernieila*, and two species and one form of *Haplothrips* are described as new.

The lily thrips (Liothrips vaneeckei Priesner), W. E. H. Hodson (*Bul. Ent. Res., 26 (1935), No. 4, pp. 469–474, pl. 1*).—Attention is drawn to the presence of *L. vaneeckei* on lilies in England. Reference is made to a report by Schopp and Doucette in 1932 (E. S. R., 68, p. 354) of its abundance upon a native lily in Oregon. The account includes an illustrated description of the several stages of the species and a discussion of its life history and habits, injury, and control measures. A method of fumigation with paradichlorobenzene is described, and the necessary apparatus to employ and technic to observe when fumigating upon a commercial scale are outlined.

Notes on Lygus simonyi Reut. (Capsidae), a cotton pest in Uganda, G. L. R. Hancock (*Bul. Ent. Res., 26 (1935), No. 4, pp. 429–438, pl. 1*).—The capsid bug *L. simonyi* has been found by the author to cause serious damage to cotton in Uganda by sucking the young leaves and apical buds, by retarding the growth of the branches, and by sucking the young bolls. There are indications that soil and climatic factors are of importance in controlling this pest.

A new species of parasite of Typhlocyba pomaria McAtee (Hymenoptera: Bethylidae), C. F. W. MUESEBECK (*Ent. Soc. Wash. Proc., 37 (1935), No. 8, pp. 167, 168*).—A parasite reared from the white apple leafhopper at Poughkeepsie, N. Y., also collected in the Champlain Valley of New York and at College Park, Md., is described as new under the name *Apholopus typhlocybae*.

The apple leaf-hopper, J. W. EVANS (*Tasmanian Jour. Agr., 6 (1935), No. 4, pp. 155–157, fig. 1*).—The apple leafhopper, possibly of European origin, was recorded in Australia in 1918 as from the United States, and has now spread to Tasmania.

Hemipterous predators of the weevils Cosmopolites and Odoiporus, W. E. CHINA (*Bul. Ent. Res., 26 (1935), No. 4, pp. 497, 498*).—The cydnid *Geotomus pygmaeus* Dall., the nabid *Phorticus pygmaeus* Popp., and the capsid *Fulvius nigricornis* Popp. are noted as predacious on the eggs, and the reduviid *Physoderes curculionis* n. sp. on the larvae, of weevils of the genera *Cosmopolites* and *Odoiporus*.

Catalog of the American species of Laternariidae (Homoptera: Fulgoroidea) [trans. title], A. DA COSTA LIMA (*Mem. Inst. Oswaldo Cruz, 30 (1935), No. 3, pp. 481–517*).—Members of the fulgorid family Laternariidae are listed, with references to the literature. An index to the genera and species is included.

The relation of foliage color to aphid resistance in some varieties of canning peas, E. M. SEARLS (*Jour. Agr. Res. [U. S.], 51 (1935), No. 7, pp. 613–619, fig. 1*).—A study at the Wisconsin Experiment Station of the resistance of certain varieties of peas to the pea aphid and the apparent relation between resistance to aphid attack and color of foliage is reported upon.

In the course of this work "three varieties of canning peas, Yellow Admiral, Onward, and Perfection were hybridized with each other, making all possible combinations. Perfection, which is susceptible, has dark-green foliage, while that of the resistant Yellow Admiral and Onward is a light green which closely approximates yellow. Yellow Admiral has a tall habit of growth. The other two varieties are dwarf. The offspring were classified in the F_3 as to height of vine and color of foliage. Color variation in the progenies was continuous, and only those which were obviously either yellow or green were used in the subsequent tests. Third-generation families of the different classes were grown in solid blocks and artificially infested with aphids when about 3 in. high. Four aphid counts were made from each class at 2-day intervals after the plants were in full bloom. These counts showed that classes with green foliage were susceptible and that those with yellow foliage were resistant in both classes of vine height. Fifth-generation dwarf families were tested as the third generation had been, except that each family was tested separately. All the yellow families in this test were resistant, while the green families were susceptible.

"The tests have shown that, among the families examined, those with yellow foliage were resistant to the pea aphid while those with green foliage were susceptible. Since this relation has held through succeeding generations, it is assumed that resistance and susceptibility are inherited with the yellow and the green foliage color, respectively. In every instance the plants were artificially infested with the same number of aphids. The ensuing aphid population is, therefore, an expression of ability to resist the attack of the insect rather than an instance of tolerance or avoidance."

Notes on western aphids, G. F. KNOWLTON (*Pan-Pacific Ent., 11 (1935), No. 3, pp. 135–142, figs. 2*).—In this contribution from the Utah Experiment Station five species are described as new, namely, *Macrosiphum sporadicum* and *Aphis nigragregalis*, both taken from *Chrysothamnus* spp.; *A. zonassa* taken from *C. parryi;* and *Cinara zoarobursara* taken from *Abies concolor*, all from Utah; and *C. chamberlini* taken from *Pinus monticola* in Washington and Oregon and reported as damaging sugar pine and white pine. Notes are presented on several additional species.

Winter mortality of black scale in relation to control treatments, R. H. Smith (*Calif. Citrogr., 21 (1936), No. 3, pp. 106, 107*).—The California Citrus Experiment Station has found that the variation in the results obtained from the insecticide treatment of the orchard for the black scale is explained by the differences in the amount of natural mortality of the scale that occurs in different years and perhaps in different groves during the fall and winter months.

Codling moth control experiments, Blackwood, 1934–35, R. Fowler (*Jour. Dept. Agr. So. Aust., 39 (1935), No. 4, pp. 458–467, figs. 2*).—In continuing codling moth control experiments (E. S. R., 73, p. 77), white oil emulsion sprays were found to give materially the same control as did arsenate of lead sprays, and when used for the last three covers resulted in less arsenical residue. It was found that while the white oil emulsion spray should be used with caution on Cleopatra apples it appeared to be safe when used on other varieties. Molasses proved more effective as a lure than apple vinegar. The need for covered traps to prevent birds interfering with records of moths trapped is pointed out. The reduction of moth populations in orchards by trapping did not seem to reduce the wastage due to codling moth injury. Chemical bandages were found to be effective traps for codling moth larvae.

The codling moth problem: Results of trials at Bathurst, S. L. Allman (*Agr. Gaz. N. S. Wales, 46 (1935), No. 8, pp. 459–463, figs. 3*).—In control work with the codling moth, the application of lead arsenate with white oil added to the last three cover sprays reduced infestation to approximately 5 percent, as compared with 67 percent in the untreated plat. "No appreciable differences were shown in the control efficiency of the various white oils employed. Where kerosene or casein was added to the lead arsenate, they were decidedly not so effective as where white oil was added, and rather less effective than where fish oil was employed. Fish oil did not afford the same measure of protection as the white oils. Of the nonarsenicals tested, nicotine sulfate plus white oil was the most effective, but was noticeably inferior to lead arsenate. A comparison of an imported and a local nicotine sulfate revealed similar efficiency. A natural and a synthetic cryolite were tested, and each afforded some measure of protection, although markedly inferior to the nicotine sulfate and oil combination."

The codling moth in India, H. S. Pruthi (*Agr. and Livestock in India, 5 (1935), No. 5, pp. 522, 523, pls. 2*).—It is reported that while the codling moth apparently has not been recorded from any part of the Indian Empire, it was found during the summer of 1935, together with the eye-spotted budmoth which does similar damage, infesting several fruits in the Quetta area, the identification having been confirmed by the Imperial Institute of Entomology, London.

Present day spray practices for codling moth control, R. L. Webster (*Better Fruit, 30 (1936), No. 8, pp. 3, 4, 10, 11, 12, figs. 3*).—A discussion of the codling moth control problem, particularly as it applies to Washington conditions.

Recent developments in codling moth control, B. A. Porter (*Penn. State Hort. Assoc. Proc., 76 (1935), pp. 51–60*).—A discussion of the status of codling moth control at the end of 1934.

The alimentary canal of the oriental fruit moth larva, R. B. Neiswander (*Ohio Jour. Sci., 35 (1935), No. 6, pp. 434–439, figs. 11*).—A brief account of the gross anatomy and histology of the digestive tract of the oriental fruit moth, contributed from the Ohio Experiment Station.

The peach moth (Cydia molesta Busck) investigations in the Goulburn Valley, Victoria: Progress report for the season 1934–35, F. J. Gay (*Jour. Council Sci. and Indus. Res.* [*Aust.*], *8* (*1935*), *No. 3*, *pp. 171–176*).—The work of the year, while of a preliminary nature, has shown that both newly hatched oriental peach moth larvae and codling moth larvae "have the habit of rejecting all surface tissue. The small size of newly hatched peach moth larvae compared with newly hatched codling moth larvae suggests that the efficiency of stomach poisons is influenced by particle size. Of the various substances tested as ovicides and cover sprays nicotine sulfate definitely gave the most promising results. Its compatability with other sprays makes it especially suitable for use in combination with early season routine sprays.

"The evidence indicates that untreated bandages not only catch large numbers of overwintering peach moth larvae, but also favor the action of native parasites. Native parasites appear to be restricted in their action to the winter months. Arrangements have been made with the United States Department of Agriculture to introduce the ichneumon parasite *Macrocentrus ancylivorus* Rohw., which attacks peach moth larvae in the spring and summer."

The moth borer (Argyria sticticraspis H.) of sugarcane in south India, T. V. Ramakrishna Ayyar and V. Margabandhu (*Agr. and Livestock in India*, *5* (*1935*), *No. 5*, *pp. 503–521*).—An account is given of the life history and habits of an important sugarcane moth borer in south India.

The times of activity of certain nocturnal insects, chiefly Lepidoptera, as indicated by a light-trap, C. B. Williams (*Roy. Ent. Soc. London, Trans.*, *83* (*1935*), *No. 4*, *pp. 523–555*, *pls. 2*, *figs. 9*).—A description is given of a light trap which has under it eight killing bottles arranged so that by a clockwork mechanism they can be changed at any time desired during the night. The trap was working in the fields at Rothamsted Experimental Station on all except 17 nights in the 2 yr. from March 1, 1933, to Feb. 28, 1935, some 109,344 insects having been captured the first year and 103,362 the second.

Some new coccid-eating gall midges (Cecidomyidae), H. F. Barnes (*Bul. Ent. Res.*, *26* (*1935*), *No. 4*, *pp. 525–530*).—This further contribution from the Rothamsted Experimental Station (E. S. R., 70, p. 66) includes descriptions of four new species of gall midges that attack coccids.

Notes on Cecidomyidae, [I], II, H. F. Barnes (*Ann. and Mag. Nat. Hist.*, *10. ser.*, *9* (*1932*), *No. 53*, *pp. 475–484*; *17* (*1936*), *No. 98*, *pp. 272–279*).—The first of these contributions from the Rothamsted Experimental Station presents information on 27 forms, of which 4 are described as new. The second contains descriptions and notes on various cecidomyids of potential or actual importance, of which 4 are described as new.

The New Jersey mosquito problem: A survey of past performance, present state, and future outlook, T. J. Headlee (*New Jersey Stas. Circ. 360* (*1935*), *pp. 19*, *figs. 9*).—This discussion of the mosquito as related to New Jersey takes up the development of fundamental theory in mosquito control, the progress of practical work, and the problem of mosquito control as related to the development of the State.

Observations on a mosquito flight in Salt Lake City, D. M. Rees (*Utah Univ. Bul.*, *25* (*1935*), *No. 5*, *pp. 6*, *fig. 1*).—A report made of observations at Salt Lake City of the flight of *Aedes dorsalis* (Meig.) in September 1932 is accompanied by a descriptive map. On different occasions the flights of mosquitoes, which appear in large broods when conditions are favorable, have been definitely traced for several miles.

British mosquitoes and their control, F. W. Edwards and S. P. James (*Brit. Mus. (Nat. Hist.), Econ. Ser. No. 4 A, 2. ed., rev. (1934), pp. 30, figs. 4*).—A revised edition of this practical account (E. S. R., 60, p. 850).

The breeding habits of Anopheles litoralis and A. indefinitus in salt-water ponds, W. V. King and F. del Rosario (*Philippine Jour. Sci., 57 (1935), No. 3, pp. 329–349, pls. 7, figs. 2*).—In the course of a study of *A. litoralis* King and *A. indefinitus* Ludlow, the two Philippine species of *Anopheles* that breed in salt water, larval collections were made in a series of ponds near Manila over a period of 12 mo. The optimum breeding conditions for each species were found to occur at a different range of salt concentrations, which in turn vary with the seasons, accounting for the marked seasonal fluctuations in the abundance of the two species. The maximum concentration in which breeding of *A. litoralis* was found was 8.8 percent.

Sand fly control in mangrove marshes, J. B. Hull and W. E. Dove (*Helminthol. Soc. Wash. Proc., 2 (1935), No. 2, p. 69*).—Reference is made to experimental control of the sand fly in the St. Lucie mosquito district, near Fort Pierce, Fla., by diking and pumping certain areas. The drying out of the soil destroys sand fly larvae, prevents the breeding of mosquitoes, and gradually reclaims land for agricultural purposes.

Lubricating oil emulsion as a buffalo gnat repellent, H. H. Schwardt (*Jour. Kans. Ent. Soc., 8 (1935), No. 4, p. 141*).—In the search in Arkansas for an efficient and noninjurious repellent for *Eusimulium pecuarum* which can be used at a moderate cost, a cold-mixed oil emulsion similar to that described by Richardson and Griffin (E. S. R., 55, p. 553) and made from potash fish-oil soap and lubricating oil, 1 lb. of the former to 3 qt. of the latter, was found to be the most promising. "Tests made during the seasons of 1933, 1934, and 1935 in various gnat infested counties in Arkansas have shown this emulsion to be equal to or superior to the repellents now in use. In addition it is very low in cost and has not caused noticeable injury to mules and cows, the animals on which tests have been made. Applications remain effective for 3 to 8 hr., depending on weather conditions and the activity of the animal."

A comparative study of the development of the Stomoxydinae (especially Haematobia stimulans Meigen) with remarks on other coprophagous muscids, M. Thomsen (*Zool. Soc. London, Proc., 1935, III, pp. 531–550, pls. 8*).—The morphology of the egg, larva, and pupa of *H. stimulans* is described, the developmental stages being compared with those of the stablefly and the hornfly. A list of 25 references to the literature is included.

The role of pine oil in cattle fly sprays, A. M. Pearson (*Delaware Sta. Bul. 196 (1935), pp. 63, figs. 46*).—The results of studies conducted from February 19, 1934, to September 30, 1935, are reported upon, the details being given in 37 tables and 39 graphs.

Tests have shown that "pine oil increases (activates) the toxicity of pyrethrum extract in relation to the amount added. The toxicity of a 1 lb. per gallon pyrethrum spray may be maintained by substituting 10, 15, or 25 percent pine oil for 0.25, 0.5, or 0.75 lb. pyrethrum, respectively. Pyrethrum-pine oil combinations, in a petroleum oil base, display the same rate of kill as a 'pyrethrum alone' spray, there being no significant mortality after 24 hr. Pyrethrum-pine oil combinations possess a higher 'knockdown' value than a pyrethrum alone spray of comparable mortality. Pine oil retards the rate of precipitation, change of color, and loss in toxicity of pyrethrum sprays when exposed to sunlight. High grade pine oils are more effective than those of low grade for combination with pyrethrum, in respect to both toxicity and the prevention of deterioration.

"Both the knockdown and mortality produced by derris extract are increased (activated) by pine oil. The rate of activation is greater than with pyrethrum. Derris-pine oil combinations exhibit the same rate of kill as derris alone, significant mortality occurring after 24 hr. High grade pine oils are more effective than those of low grade when combined with derris extract. The differences are not as distinct, however, as with pyrethrum. The effect of pine oil upon the toxicity of rotenone and of derris extract is similar. Pine oil in concentrations as high as 25 percent produces no effect upon the toxicity of an aliphatic thiocyanate.

"High grade pine oils are more toxic than those of low grade. From the standpoints of efficiency and economy, however, none of the pine oils tested are superior to No. 303 [the commercial product Yarmor] in toxicity, or as an activator of pyrethrum and derris extracts. It exhibits greater toxicity when incorporated with a base oil of low viscosity (30–35 [Saybolt] sec.) than with a base oil of high viscosity (85 sec.)."

In the tests conducted it was found that "pine oil increases the repellence of pyrethrum extract in relation to the amount added. The repellence of a 1 lb. per gallon pyrethrum spray may be maintained by substituting 10 or 15 percent pine oil for 0.25 or 0.5 lb. pyrethrum, respectively. Pine oil increases the repellence of derris extract in relation to the amount added, but not at as great a rate as that of pyrethrum extract. The repellence of an aliphatic thiocyanate is unaffected by the addition of pine oil.

"Cows sprayed with 25 percent pine oil in No. 40 base oil suffered no skin injury or other ill effects from such treatment. The repellent efficiency of base oil No. 40 (alone) apparently varies from 20 to 78 percent. An average of 44 percent was recorded in each of two series of tests. Pine oil may be safely and economically employed in practical cattle fly spray formulas."

Blowflies and locust poisoning: Scarcity of blowflies during the season 1934–35, A. H. de Vries (*Farming in So. Africa, 11 (1936), No. 118, pp. 21, 22*).—It is concluded that the scarcity of blowflies in South Africa during the season 1934–35 was due in general to extensive locust spraying operations and to climatic conditions, especially abnormally and unseasonably cold weather, which retarded their development.

Studies on the higher Diptera of medical and veterinary importance.—A revision of the species of the genus Glossina Wiedemann based on a comparative study of the male and female terminalia, W. S. Patton (*Ann. Trop. Med. and Parasitol., 29 (1935), No. 4, pp. 483–496, figs. 11*).—A continuation of the author's studies (E. S. R., 74, p. 375).

The effects of temperature and humidity on the cheese skipper (Piophila casei (L.)), J. Smart (*Jour. Expt. Biol., 12 (1935), No. 4, pp. 384–388, fig. 1*).—The results of a short series of experiments carried out to determine the thermal death point under conditions of controlled humidity of the larva and pupa of the cheese skipper are reported.

The larva was found to be extremely resistant to high temperatures, having withstood 52° C. for 1 hr. and 45° for 24 hr. The death of the pupa at a much lower temperature was shown to be due to a secondary effect of temperature on its physiology.

Are some honeybees immune to Bacillus larvae? R. G. Richmond (*Jour. Colo.-Wyo. Acad. Sci., 2 (1935), No. 1, p. 76*).—Recent experiments are said to indicate that some strains of honeybees may have a form of immunity to American foul brood.

Progress report of the Dominion apiarist, C. B. Gooderham (*Canada Expt. Farms, Bee Div. Rpt. 1931–33, pp. 37, figs. 6*).—This further report deals with experimental work for the years 1931–33 (E. S. R., 67, p. 440).

The biology and economic status of the common black ant of south India—Camponotus (Tanaemyrmex) compressus Latr., P. N. Krishna Ayyar (*Bul. Ent. Res., 26 (1935), No. 4, pp. 575–586, pls. 2, figs. 2*).—The common black ant *C. compressus* here dealt with, one of the most abundant and best-known species of ants in south India, is an indirect source of injury to a variety of cultivated crops,, ornamental plants, trees, and shrubs through its symbiotic association with many mealybugs, scale insects, aphids, fulgorids, psyllids, membracids, and lycaenid caterpillars.

Two chalcidoid egg-parasites of Diprion sertifer Geoffr., C. Ferrière (*Bul. Ent. Res., 26 (1935), No. 4, pp. 571–573, figs. 2*).—*Tetracampe diprioni*, reared from the eggs of *D. sertifer* in Sweden, is described as new. The egg parasite *Achrysocharella ruforum* Krausse, from Czechoslovakia, is redescribed.

An egg parasite of the plague grasshopper, N. S. Noble (*Agr. Gaz. N. S. Wales, 46 (1935), No. 9, pp. 513–518, figs. 6*).—Observations of *Scelio fulgidus*, which breeds in the egg of the plague grasshopper *Calataria* (*Chortoicetes*) *terminifera* in New South Wales, are reported upon. It is concluded that this parasite is incapable of preventing the occurrence of periodical outbreaks of grasshoppers, but once the outbreaks do occur this parasite takes an important part in again reducing them to harmless numbers.

Brachymeria carinatifrons, new species (Hymenoptera: Chalcididae), A. B. Gahan (*Ent. Soc. Wash. Proc., 37 (1935), No. 8, pp. 165–167*).—The chalcid here described as new is said to have been reared from puparia of *Paradexodes epilachnae* Ald., parasitizing *Epilachna varivestis* Muls. and *E. defecta* Muls. at Cuernavaca, Mexico.

Descriptions of two important chalcids from Egypt and the Sudan [trans. title], C. Ferrière (*Bul. Soc. Roy Ent. Égypte, 28 (1935), pp. 365–370, figs. 3*).—*Dirhinus wohlfahrtiae*, reared from the pupa of *Wohlfahrtia nuba* Wied. at Khartoum, Sudan, and *Elasmus platyedrae* from the pink bollworm at Bahtim and Giza in Egypt, are described as new.

The woolly aphid parasite: Effect of orchard sprays on Aphelinus mali, N. S. Noble (*Agr. Gaz. N. S. Wales, 46 (1935), No. 10, pp. 573–575, figs. 2*).—In a series of laboratory experiments with nicotine sulfate, various miscible oils, and lime-sulfur on *A. mali*, all were found to have little or no influence on the emergence of parasites. In an examination of the parasitized aphids on the twigs treated, in which 100 percent parasitism was found, 28 percent of the total parasites were in the pupal stage and 39.33 percent contained either mature larval or pupal parasites.

Descriptions of two new encyrtid parasites of non-diaspine scales, H. L. Dozier (*Ent. Soc. Wash. Proc., 37 (1935), No. 9, pp. 183–185*).—*Aenasioidea trimblei*, reared from *Lecanium quercifex* on white oak at Caledonia, Pa., and *Coccidoctonus ceroplastae*, reared from the three species of *Ceroplastes* on imported *Ficus* spp. in Haiti, where it appears to be the principal controlling factor for the Florida wax scale, are described as new.

On two little known genera of Braconidae (Hymenoptera), C. F. W. Muesebeck (*Ent. Soc. Wash. Proc., 37 (1935), No. 9, pp. 173–177, figs. 2*).—In this contribution the genera *Dirrhope* and *Acrisis* are redefined, and the species *D. americana* reared from *Ectoedemia phleophaga* Busck in Falls Church, Va., is described as new.

Observations on saw-flies of the genus Perga, with notes on some reared primary parasites of the families Trigonalidae, Ichneumonidae, and Tachinidae, J. W. Raff (*Roy. Soc. Victoria, Proc., n. ser., 47 (1934), No. 1, pp. 54–77, pls. 2, figs. 2*).—The several sections of this contribution deal, respectively, with the life history of the sawflies from the time of entering the soil for cocoon spinning to the emergence of the adult, the results of emergences from captive broods of sawfly larvae, and notes on primary parasites of *Perga* spp., namely, Trigonalidae, Ichneumonidae, and Tachinidae.

The cockchafer beetle: Its incidence and control, H. W. Thompson (*Welsh Jour. Agr., 10 (1934), pp. 308–316, pl. 1*).—Observations of *Melolontha vulgaris* F. made by the author in Monmouthshire, south Wales, have shown naphthalene at the rate of 5 to 6 cwt. per acre to give control of chafer grubs when applied in the early autumn, and that satisfactory control of the grubs can also be obtained by summer applications when the material can be worked into the ground, or when there is sufficient rain to wash it well in.

On grassland, control was obtained on a test plat at one center by a dressing of 3 cwt. per acre, while at another the test failed owing to the abnormally dry weather conditions. It is recommended that where naphthalene dressings are resorted to, applications of 5 or 6 cwt. per acre be given. In one case on grassland and one on arable land control was obtained by applications at half that strength; in each of these two cases, however, exceptionally heavy rain followed the application and may account for the satisfactory result.

It appears that a heavy dressing of soot may also be effective as a control measure.

The control of Phyllopertha horticola L. in grassland, C. L. Walton (*Univ. Bristol, Agr. and Hort. Res. Sta., Long Ashton, Ann. Rpt., 1934, pp. 150–157, fig. 1*).—A report is made upon a serious infestation of 20 acres of grassland near Yeovil, Somersetshire, with the larvae of *P. horticola*.

"Surface dressings of crude naphthalene applied at the rate of 2 cwt. per acre in early October 1933 effected a marked control of the larvae for that season. Further field trials and observations carried out during 1934 showed that the adult beetles preferred hay grass to land closely grazed; they failed to oviposit on land mown at the commencement of their flight period. A trial, using 56 lb. per acre of flowers of sulfur, applied as a surface dressing to meadow and pasture grass as a deterrent to oviposition, yielded results of an indeterminate character."

A new Ataenius from Florida (Coleoptera: Scarabaeidae), O. L. Cartwright (*Canad. Ent., 66 (1934), No. 9, pp. 200, 201*).—This is a contribution from the South Carolina Experiment Station.

The biology and distribution of Rhizopertha dominica (Fab.), C. Potter (*Roy. Ent. Soc. London, Trans., 83 (1935), No. 4, pp. 449–482, figs. 25*).—This contribution, presented with a three-page list of references to the literature, deals with the nomenclature and synonymy, distribution, substances recorded as food, life history of specimens fed on synthetic whole meal flour under controlled conditions of temperature and humidity, and natural enemies of the bostrychid beetle *R. dominica*. Detailed descriptions of the mature larva and adult beetle are included.

Recent studies of this pest, known as the lesser grain borer, by Schwardt at the Arkansas Experiment Station have been noted (E. S. R., 66, p. 549; 69, p. 835).

The control of the brassy willow beetle Phyllodecta vitellinae L., with special reference to the use of dusts, H. P. Hutchinson and H. G. H. Kearns (*Univ. Bristol, Agr. and Hort. Res. Sta., Long Ashton, Ann. Rpt., 1934, pp. 147–149*).—The experiments reported have shown that a satisfactory control of *P. vitellinae* can be secured by the use of a derris dust. Under dry weather conditions, the powder retained after application sufficient effective toxicity to kill or to repel wandering beetles for at least 3 days.

Heredity of color pattern in the coccinellid Adalia Mulsant, M. A. Palmer (*Jour. Colo.-Wyo. Acad. Sci., 2 (1935), No. 1, p. 75*).—A contribution from the Colorado Experiment Station.

Observations on the seasonal activities of wireworms (Elateridae), H. R. Bryson (*Jour. Kans. Ent. Soc., 8 (1935), No. 4, pp. 131–140, fig. 1*).—Contributing from the Kansas Experiment Station, the author presents the details of observations in table and chart form. He has found that "wireworms move upward and downward in the soil in response to unfavorable environmental conditions at the surface. Extreme soil temperatures, above 80° F. or below 32°, apparently are unfavorable to the larvae. Observations and collection data indicate that the larvae can withstand freezing temperatures without apparent injury. Similar observations show that they are injured by high temperatures which dry out the soil. The data show that the larvae are below the plow line during November, December, and January in the cold season of the year and during July and August during the summer season. Diggings reveal the fact that the larvae are near the surface or at least above plow line during the other severe months of the year. Collection records show the larvae feeding near the surface on the roots of weeds and various cultivated plants. Food studies indicate a predacious habit. Recommendations to fall plow as a means of control for this pest would be of questionable value."

A natural enemy of Stephanoderes hampei Ferr.: Beauveria bassiana (Bals.) Vuill.—A study of the environmental factors determining its increase, R. L. Steyaert (*Un ennemi naturel du Stephanoderes: Le Beauveria bassiana (Bals.) Vuill.—Etude des facteurs ambiants régissant sa pullulation. Bruxelles: Inst. Natl. Etude Agron. Congo Belge, 1935, pp. 46, figs. [16]*).—This is a report of studies of a fungus parasite of the coffee berry beetle borer *S. hampei* in the Belgian Congo, the details of which are given in tables and charts presented with a list of 28 references to the literature.

On the chestnut weevil Curculio dentipes (Roelofs), especially on the larval stage, M. Katô (*Tôhoku Imp. Univ., Sci. Rpts., 4. ser., 10 (1935), No. 3, pp. 515–553, pls. 5, figs. 23*).—Studies of the anatomy and biology of *C. dentipes*, which is more destructive than the moth pest *Cydia splendana* Hübn. with which it is associated, are reported upon, the details being given in 19 tables and illustrated with 17 charts. Of 5,270 nuts collected at Akiu, 60.8 percent contained punctures or eggs, from 48 percent of which infested nuts larvae emerged.

The Texas citrus mite, a new species, E. A. McGregor (*Ent. Soc. Wash. Proc., 37 (1935), No. 8, pp. 161–165, figs. 8*).—Under the name *Anychus clarki*, a mite which occurs throughout the Lower Rio Grande Valley citrus area and is a source of injury to citrus is described as new.

Observations on the Ixodoidea of the Argentine Republic [trans. title], H. de Beaurepaire Aragão (*Mem. Inst. Oswaldo Cruz, 30 (1935), No. 3, pp. 519–534, pl. 1; Eng. abs., p. 531*).—A list of the species of ticks recognized as occurring in Argentina, 23 in number; a list of the species with their hosts and the localities in which collected, presented in table form; host and collection locality notes on 71 lots comprising 13 different species of ticks received at the Oswaldo Cruz Institute from S. Mazza; and notes on 10 of the species listed are included, accompanied by a bibliography of 36 titles.

Description of a tick, Ornithodoros coprophilus n. sp., from bat guano, A. McIntosh (*Parasitolgoy, 27 (1935), No. 4, pp. 519–522, pl. 1, figs. 2*).—Under the name *O. coprophilus* a tick taken from bat guano originating at Linares, Mexico, probably a parasite of bats, also collected from bat guano at Tucson, Ariz., is described as new.

[The black widow spider (Latrodectus mactans)], F. E. Becker and F. E. D'Amour (*Jour. Colo.-Wyo. Acad. Sci., 2 (1935), No. 1, pp. 44–46*).—A brief account of the black widow spider in which (1) the natural history (pp. 44, 45) and (2) the properties of the venom (pp. 45, 46) are considered.

A review of the biology and distribution of the hourglass spider, C. E. Burt (*Jour. Kans. Ent. Soc., 8 (1935), No. 4, pp. 117–130*).—This review, presented with a list of 23 references to the literature, includes a detailed account of the geographical distribution, by States, of *Latrodectus mactans* Fab., the localities and dates of occurrence, together with the authority, being given.

ANIMAL PRODUCTION

[Investigations with livestock in Arkansas] (*Arkansas Sta. Bul. 323 (1935), pp. 30–32*).—The results obtained in tests with livestock are reported on soybean pasture, cowpea pasture, and Sudan grass for growing and fattening pigs, and rough rice for finishing swine, both by E. Martin; and factors affecting the carrying quality of eggs, by R. M. Smith.

[Investigations with livestock at the Cornell Station] (*[New York] Cornell Sta. Rpt. 1935, pp. 78–83, 128–133*).—Information obtained in tests with sheep are reported on rations for fattening lambs, and chopped as compared with uncut hay for bred ewes, both by F. B. Morrison and J. P. Willman; relation of feeding and management to the cause of the "stiff lamb" disease, by Willman, Morrison, and P. Olafson; and temporary pasture crops for lambs, and creep feeds for hothouse lambs, both by Willman.

The results of studies with other livestock are given on the protein intake for yearling steers, by R. B. Hinman and Morrison; the curing of pork by the use of "smoke salt", by Hinman and C. D. Schutt; a comparison of tankage, menhaden fish meal, and whitefish meal as protein supplements in rations for growing and fattening pigs, by Morrison and Willman; and protein requirements of the work horse, and iodine for the brood mare and foal, both by M. W. Harper and R. M. Watt.

Poultry studies yielded data on air conditioning in poultry houses, by G. O. Hall, J. H. Bruckner, and F. L. Fairbanks; the requirement of poultry for vitamin G, by L. C. Norris and A. T. Ringrose; artificial incubation of eggs of domestic birds, and artificial incubation of game birds' eggs, both by A. L. Romanoff; the calcium and phosphorus requirements of poultry, by Norris, G. F. Heuser, and Ringrose; cane molasses as a substitute for corn meal in laying rations, by Norris and Heuser; a genetic study of interior egg quality, by Hall and A. Van Wagenen; the protein requirement and prevention of perosis in game birds, by Norris and L. J. Elmore; the effect of the nutrition of the hen upon interior egg quality, by H. S. Wilgus, Jr., Heuser, and Norris; studies of the nutritive properties of corn gluten meal, by Norris and Ringrose; the relative vitamin G content of feeding stuffs used in poultry rations, by Wilgus, Norris, and Heuser; and the role of flavin in the nutrition of poultry, by Norris, H. J. Davis, and R. C. Sullivan.

Growth and development with special reference to domestic animals.—XXXVII, Interrelations between protein intake, endogenous nitrogen excretion, and biological value of protein, U. S. Ashworth (*Missouri Sta. Res. Bul. 228 (1935), pp. 15, figs. 2*).—Continuing this series of investigations (E. S. R., 73, p. 662), the object of this phase of the study was to determine whether lactalbumin produced more reserve protein than corn gluten when both proteins were fed at the same low level to 20 pairs of young rats.

It was found that the nature of the protein fed affected but slightly the nitrogenous nitrogen excretion when short experimental periods were used. When the reserve protein supply of the body was reduced to a low level by long periods on nitrogen-free diets, an effect of the nature of the protein fed on nitrogenous nitrogen excretion did appear.

The results of this study suggest the use of short experimental periods to avoid the effect of the nature of the protein fed on the nitrogenous nitrogen excretion. On the other hand, the short period increases the variability of the reserve protein present in the body and the nitrogenous nitrogen excretion and, therefore, the biological values of the protein. The use of the short period makes the method of doubtful value in determining small differences in the biological value of different proteins or protein mixtures. In order to determine these small differences with reliability, a method of securing more consistent values for the nitrogenous nitrogen excretion must be devised.

The influence of the ingestion of colostrum on the proteins of the blood sera of young foals, kids, lambs, and pigs, I. P. Earle (*Jour. Agr. Res. [U. S.], 51 (1935), No. 6, pp. 479–490*).—The U. S. D. A. Bureau of Animal Industry undertook a study to determine the changes which result from colostrum ingestion in the protein concentration and in the distribution of protein fractions in the blood sera. In this study 10 foals, 3 kids, 6 lambs, and 4 pigs were used. Some of the young of each species were allowed to suckle their dams, while others were fed from a bottle. Protein analyses were made of the blood sera from the newborn animals and from the same animals at intervals after feeding.

It was found that the serum of the newborn animals was deficient in the euglobulin fraction of the serum proteins. In all cases pseudoglobulin I was present, but only in very small quantities. In those animals which received no colostrum from their respective dams there was little or no increase in the serum globulins, except in the case of one kid whose serum contained increased globulins on the twentieth day after birth. In the case of the animals which received colostrum there was a marked increase in total serum nitrogen within 24 hr. after birth. This change resulted from increases in euglobulin and pseudoglobulin I in the serum, but there was a decrease in these fractions for some days after the initial rise. In young foals the amount of absorption of euglobulin and pseudoglobulin I was related to the quantity of colostrum globulins ingested.

The comparative rachitogenic property of oats and corn, L. L. Lachat and L. S. Palmer (*Jour. Nutr., 10 (1935), No. 5, pp. 565–577*).—This paper from the Minnesota Experiment Station reports the results of a study of the comparative rachitogenic properties of oats and corn. Both rats and chicks were used as experimental animals because of the recognized differences between the etiological factors concerned in the production of rickets in these species.

It was found that hydrochloric acid extracts of oats, when purified and freed from excessive amounts of salt, may have rachitogenic properties when fed to rats in a mildly rachitogenic ration but none of these properties when the ration was severely rachitogenic. Rolled oats and yellow corn were rachitogenic for both rats and chicks, especially the latter. Rolled oats appeared to be more rachitogenic when the ration was otherwise only slightly rickets producing or the susceptibility of the animals was low. The authors point out that the divergent results obtained by other investigators on the relative rachitogenic properties of cereals may be explained by the lack of control of the severity of the rickets produced.

The composition of draw-moss, B. Thomas (*Jour. Min. Agr. [Gt. Brit.], 42 (1935), No. 5, pp. 458–461, pls. 2*).—In this paper from Armstrong College, the author reports the chemical composition of draw-moss or sheathed cotton grass (*Eriophorum vaginatum*). This grass plays an extremely important part in the nutrition of sheep. It has an exceedingly highly phosphorus content and very little lime. It attains its highest nutritive value during spring.

Commercial feeding stuffs from September 1, 1934 to August 31, 1935, F. D. Fuller and J. Sullivan (*Texas Sta. Bul. 518 (1935), pp. 182*).—This is the usual report of the results of the chemical analyses and microscopic examination of 3,080 samples of feeding stuffs (E. S. R., 73, p. 88).

Identity of natural vitamin D from different species of animals, O. Rygh (*Nature [London], 136 (1935), No. 3440, pp. 552, 553*).—The State Vitamin Institute, Oslo, Norway, isolated the unsaponifiable fraction from the liver and body fat of 18 species of fish, a cow, and a human female. The vitamin A of this fraction was eliminated and the vitamin D concentrated to some extent. No difference was found in the antirachitic effect in chicks of all these fats, the daily dose required being in all cases from 70 to 80 international D units per chick. There was no evidence that the vitamin D in all the fats investigated was not the same.

Fluorine in animal nutrition, C. H. Kick, R. M. Bethke, B. H. Edgington, O. H. M. Wilder, P. R. Record, W. Wilder, T. J. Hill, and S. W. Chase (*Ohio Sta. Bul. 558 (1935), pp. 77, figs. 19*).—These investigations were undertaken to study the specific effects of fluorine in the form present in rock phosphate and chemically pure fluorides on growth, reproduction, bones, and various other tissues of the pig (E. S. R., 69, p. 843), rat, and chick (E. S. R., 71, p. 364).

It was found that sodium fluoride was much more toxic to all of these animals than calcium fluoride when the salts were fed at comparable fluorine levels, and that rock phosphate, phosphatic limestone, and treble superphosphate were intermediate in this respect. Excessive amounts of available fluorine in the ration reduced the growth and feed consumption of pigs and chicks and definitely increased the feed required per unit of gain for pigs. When pigs received rations containing more than 0.029 percent of fluorine as sodium fluoride or more than 0.033 percent as rock phosphate, the bones were characterized by increased thickness, loss of normal color and luster, presence of exostoses, and a decreased breaking strength. Such bones contained normal amounts of ash, calcium, and phosphorus, increased amounts of magnesium and fluorine, and decreased percentages of carbonates. The changes were directly correlated with increased ingestion of fluorine. The increase in the thickness of the mandibles of pigs on fluorine diets was due to an increase in the size of the medullary spaces. A change also occurred in the bone marrow.

Excessive amounts of fluorine caused hypoplasia of the enamel of the teeth of rats and pigs. Over long periods of time the teeth of pigs on such rations became so soft that they were worn down until in some cases the pulp cavities were exposed. The incisors of rats became white in color, and some were elongated with the occluding incisor worn down or broken off. The dentine was also affected. The amounts of ash, calcium, phosphorus, magnesium, and carbon dioxide in the teeth were unaffected, but the percentage of fluorine increased in direct proportion to the amount of the element present in the ration. High levels of fluorine had no direct effect upon reproduction in rats or pigs, but adversely affected lactation through decreased feed consumption. Large amounts of the element caused an increased water consumption and a diuresis in pigs. Sodium fluoride, calcium fluoride, and phosphatic limestone had no evident effect on the livers, kidneys, spleens, thyroids, or parathyroids of rats or on the livers or kidneys of pigs. Adding 1 percent or more of rock phosphate to the ration of pigs caused a degeneration of the epithelium of the convoluted tubules and a fibrosis of the kidney, but had no such effect on rats.

Feeding sodium fluoride at a 0.05 percent level caused a retardation in the growth rate of the rat, but had no effect on the percentage of bone ash at maturity. Rock phosphate or sodium fluoride at levels of 0.071 percent retarded calcification of the bones of rats at 5 and 10 weeks of age. Approximately 30 percent of the fluorine ingested in the form of rock phosphate, sodium fluosilicate, and sodium fluoride was retained in the body of the rat, while none of the fluorine of calcium fluoride was retained. High fluorine rations increased the rate of coagulation of blood in the chick and decreased it in the rat. Rock phosphate could be fed to pigs at 0.5 percent levels and to chicks at 2 percent levels for short periods without danger of toxicity, but for longer periods these levels had to be reduced.

The influence of progressive ripening of fodders on the mineral nutrition of cattle, I–III (*Indian Jour. Vet. Sci. and Anim. Husb., 5 (1935), No. 2, pp. 129–157*).—The results of this study by the Animal Nutrition Section, Bangalore, are reported in three parts.

I. *Mineral composition and the mineral balance as influenced by progressive ripening of fodders*, A. Viswanatha Iyer (pp. 129–139).—This phase of the study was concerned with the extent to which mineral assimilation was affected by the maturing of fodder crops under Indian conditions. From two to three cuttings were made of Rhodes grass, Aurangabad grass, spear grass, and jowar grass at different stages of maturity and fed on a maintenance basis to two bullocks for 30-day periods. The mineral content of these grasses was found to vary from one to the other and also with the stage of maturity. The feeding tests showed that the stage of maturity greatly affected the assimilation of the minerals. The first cuts of these hays all gave positive mineral balances, and in general the mineral balances became less favorable as maturity advanced.

II. *Urine characteristics as influenced by progressive ripening of fodders*, N. Krishna Ayyar (pp. 140–147).—In this phase of the work the acid-base balance of the urine of the bullocks fed the above fodders was determined, using a procedure previously reported (E. S. R., 69, p. 699). It was noted that the early-cut fodders were marked by the elimination of large volumes of urine, attributable to the high alkali content of the feed, but with advancing maturity the total fixed bases decreased and the pH of the urine tended to become lower. The bases in the urine of bullocks fed two fodders were very low, even with the first cutting, and later cuts showed serious deficiency of bases. One late-cut fodder produced definite nutritional acidosis marked by a large increase in urinary ammonia. The species of grass and the stage of maturity both markedly influenced the mineral supply to and the acid-base balance in the animal. The excretion of lime and magnesia was not proportional to the intake but depended almost entirely on the pH of the urine. There appeared to be an inverse relation between urinary lime and urinary phosphoric acid. The results indicated that calcium assimilation was influenced by the urine reaction.

III. *The blood characteristics as influenced by progressive ripening of fodders*, N. C. Das Gupta (pp. 148–157).—Blood samples were drawn from the above animals after they had been on the rations for at least 20 days to study the effect of the feeds on the blood characteristics. A marked change in the inorganic phosphorus of the blood was noted within 3 days after a change of ration, and the full effect was attained in less than 3 weeks. The level of inorganic phosphorus of serum was dependent upon the dietary phosphorus level and the nature of the food. Blood calcium did not vary directly with the calcium content of the feed, and there was no direct relation between the calcium-phosphorus ratio and the serum calcium. The blood calcium level was influenced by the nature of the feed and its stage of maturity. The serum calcium frequently paralleled the acid-base balance and the urinary excretion of calcium, but there were important exceptions to this rule.

Steer feeding in southeastern Wyoming, C. W. Roath (*Wyoming Sta. Bul. 212 (1935), pp. 20, figs. 3*).—The results of 3 years' steer feeding experiments at the Goshen County Experiment Farm are reported. Yearling steers were fed rations composed largely of sugar beet byproducts and other feeds produced in southeastern Wyoming. Cottonseed cake was used as a protein supplement and monocalcium phosphate as a mineral supplement.

Adding grain to a beet pulp, cottonseed cake, molasses, and alfalfa hay ration increased the average daily gains for the 3-yr. period from 2.4 to 2.5 lb. per head and increased the appraised value from $7.37 to $8.15 per hundredweight. A ration of alfalfa hay and a grain mixture made up of ground corn, wheat, and barley produced practically the same gain as did the pulp, cake, molasses, and alfalfa hay ration, and the appraised value of the steers fed the latter ration was only 12 ct. per hundredweight higher than that of the steers on the hay-grain ration. In one year's test the steers fed Johnstown (barium process of refining) molasses in addition to the pulp, cake, and alfalfa hay made gains of 2.7 lb. per head per day as compared with steers fed Steffens molasses which gained 2.5 lb. per head daily. Most of the steers in the Johnstown molasses lot were appraised at 50 ct. more per hundredweight. Adding pulp, cake, and molasses to a hay-grain ration increased the rate of gain and degree of finish and improved the health and appearance of the steers.

Blackstrap molasses and corn-soybean silage for fattening steers, M. G. Snell (*Louisiana Sta. Bul. 266 (1935), pp. 22*).—The results of the studies reported in this bulletin are divided into two parts.

Digestion trials with molasses.—In this phase of the experiment, digestion trials were conducted with steers to determine the effect of molasses upon the digestibility of rations. Adding molasses to a ration containing no silage had no significant effect on the digestibility of the crude protein, ether extract, or crude fiber. The nitrogen-free extract and the ash digestibility were significantly increased, probably due to the molasses adding these nutrients in a highly digestible form. The one case in which the digestibility of nitrogen-free extract was decreased was probably due to an excess of sugars. Molasses added to a dry ration had no significant effect on the nitrogen balance. When added to a dry ration, molasses increased the ash, calcium, and magnesium balances but did not affect the phosphorus balance. Adding silage to the dry ration had no significant effect on the digestibility of the nutrients except to lower the digestibility of the ash. Molasses added to the silage ration lowered the digestibility of the crude protein and increased the digestibility of the ether extract and ash and also lowered the nitrogen balance of the ration.

Blackstrap molasses and corn-soybean silage for fattening yearling steers.—In order to obtain information on the value of molasses as a feed for cattle, two feeding trials of 140 and 150 days, respectively, using four lots of 10 steers each, were conducted. It was found that satisfactory gains were made with rations of ground whole ear corn, cottonseed meal, and grass hay. In one case the addition of corn-soybean silage to the above ration increased the gains and in the other case decreased them, but in the latter instance the silage was of poor quality. Adding molasses to the ration, either with or without silage, resulted in an increased consumption of hay and a more complete consumption of the entire ration. When fed with the dry ration, molasses had about 94 percent the feeding value of ground whole ear corn, while, when fed with the silage ration, it had about 87 percent the value of the corn.

The effect of sulphur on Bellary sheep, T. Murari (*Madras Agr. Jour., 23 (1935), No. 7, pp. 266–268*).—Bellary sheep at the Hosur Livestock Research

Station, India, were divided into two lots of six rams and six ewes each. One group was fed $\frac{1}{16}$ oz. of flowers of sulfur per head per day, while the other group was used as a control. The results indicated that the small gains made in either live weight or wool yield did not warrant the inclusion of sulfur in the ration.

Effect of age, sex, and fertility of Angora goats on the quality and quantity of mohair, J. M. Jones, B. L. Warwick, W. H. Dameron, and S. P. Davis (*Texas Sta. Bul. 516* (*1935*), *pp. 34, figs. 11*).—The results reported in this bulletin are based on the records of registered Angora goats raised at the Ranch Experiment Station.

It was found that the age of the animal had a marked influence on the weight of the fleece and on the diameter of fiber. The influence of age was less marked on the length of staple, amount of kemp, and the face, neck, and belly covering. Body weight was also influenced by age. Males produced heavier and coarser fleeces with slightly shorter staple than females. Pregnancy and lactation lowered the weight of fleece and length of staple. While pregnancy and lactation could reduce body weight at the younger ages, this was offset by the fact that the larger females with more advanced development were the ones that were fertile at the earlier ages. No direct effect on diameter of fiber was found due to pregnancy. Maximum fleece weight of females was reached at 3 yr. of age, while maximum body weight and diameter of fiber were not reached until 8 yr. of age. The maximum staple length was attained the first year, but the most mohair per pound of body weight was produced the second year. On the basis of these facts, it is concluded that the most efficient production was at 2 yr. of age, followed by a rapid decline with advancing age.

In order to facilitate the study of records, a set of conversion factors was prepared for use when it is desired to group together records of animals of different age, six, and fertility.

Chemical analysis of blood of five male and five female carabaos, E. G. Posa (*Philippine Agr.*, *24* (*1935*), *No. 5, pp. 388–392*).—The results of blood cell counts and hemoglobin determinations are given in tabular form, and the figures are averages of at least four determinations. The calcium content of the serum of the blood of the animals studied was more than twice the calcium content of the serum of other animals.

The effects of various amounts of shrimps as a supplement in rations for growing pigs, M. G. Angel (*Philippine Agr.*, *24* (*1935*), *No. 6, pp. 488–497*).—Using four lots of six pigs each and the same basal ration, 5, 10, 15, and 20 parts of shrimps were fed to the experimental lots. The trial was divided into three 70-day periods.

On the basis of rate of gain and feed consumed per unit of gain, the ration with 10 percent of shrimps gave the best results during the first 70 days. The other rations ranked in the following order, 15, 20, and 5 percent shrimps. In cost of feed per unit of gain the rations ranked 10, 5, 15, and 20 percent shrimps, respectively. In the second and third periods the 5 percent shrimps gave the best results, followed in order by 10, 15, and 20 percent. On the basis of rate and economy of gain for all periods the ranking for the rations was 5, 10, 15, and 20 percent, but in feed requirements per unit of gain 10 percent shrimps was slightly better than 5 percent.

Preliminary report of artificial insemination of mares in the Philippines, A. C. Gonzaga (*Philippine Jour. Anim. Indus.*, *2* (*1935*), *No. 2, pp. 147–152*).—This paper from the University of the Philippines reports the results of observations made on the artificial insemination of 13 mares at different ages.

Of eight mares inseminated a few minutes after the semen was collected five became pregnant, while two of the five mares inseminated some hours after the collection conceived. The functional integrity of the spermatozoa of the stallion appeared to suffer under artificial conditions. The stallions used in this work varied in the fecundating power of their semen.

Adequacy of simplified rations for the complete life cycle of the chick, A. G. Hogan, R. V. Boucher, and H. L. Kempster (*Jour. Nutr., 10 (1935), No. 5, pp. 535–547, fig. 1*).—Continuing these studies (E. S. R., 70, p. 77), four successive generations of chicks were reared on simplified diets. All of the chicks grew rapidly and the males were normal in appearance while under observation, but their fertility was low. The females were normal until they attained maturity, and their egg records compared favorably with those obtained under normal conditions. However, after periods of intensive production the mortality of these hens was high. The authors point out that if data published by other investigators showing that the low fertility and high mortality were due to the fact that the birds were reared under laboratory conditions were correct, then the simplified diets were complete in all respects.

The effects of varying amounts of animal protein fed to White Leghorn pullets.—I, The influence of low-, medium-, and high-protein diets on the weight and number of eggs, C. C. Rhodes, L. H. Bartel, and P. E. F. Jooste (*Empire Jour. Expt. Agr., 3 (1935), No. 11, pp. 215–228, figs. 8*).—In this study at the Stellenbosch-Elsenburg College of Agriculture, Union of South Africa, three groups of 20 White Leghorn pullets each were fed mash feeds containing 15.6, 20.3, and 29.1 percent of crude protein, respectively. The same kind and amount of grain, separator milk, and mineral feeds were available to all lots.

The amount of mash consumed by the groups when self-fed depended on the protein content of the mashes and on the season. Grain consumption was fairly constant throughout the year. The differences in milk consumption were not consistent, but the high-protein group consumed much more than either the low- or medium-protein group. There was a definite difference in the protein consumption of the groups, and all fluctuated consistently during the various months of the year. There was also a definite difference in the ratio of protein to total carbohydrates consumed, but the birds showed a decided tendency to balance their rations to a common nutritive ratio.

A progressive difference in numerical production of recorded eggs was noted, but it was significant only between the low- and high-protein groups. There was no significant difference in egg size or body weight between the groups. There was a consistent increase in egg size until August, amounting almost to a straight line when graphically presented. There appeared to be no relationship between the amount of protein consumed and the number of eggs produced from month to month and the size of eggs produced during corresponding months. The gradual consistent increase in egg size was independent of environment and feeding but was closely related to increase in body weight during the first laying year.

The feeding value of corn bran in rations for growing chicks, C. S. Tolentino (*Philippine Agr., 24 (1935), No. 5, pp. 413–424, fig. 1*).—This study was divided into three trials in which five lots of 67 chicks each were used.

When supplemented with shrimp meal, corn bran was much better than rice bran but decidedly inferior to corn meal alone for chicks. Chicks fed corn bran or corn bran and rice bran grew more slowly than those fed corn meal or corn meal and rice bran. In rapidity of growth the rations ranked as follows—corn meal and rice bran, corn meal, corn bran, and corn bran and rice bran. In weight at 12 weeks of age there was no significant difference between the chicks fed the first two rations. In large quantities rice bran was unsatisfactory for growing chicks.

There was no marked difference in the amounts of feed consumed by the different lots. In economy, corn meal was better than corn bran or a combination of corn bran and rice bran. For growing stock the rice bran and corn meal combination was better than corn bran or rice and corn bran. Chicks fed corn bran alone or in combination were less vigorous than those fed corn meal alone or in combination. There was no great difference in the individual growth rates of the chicks fed corn bran and those fed corn and rice bran.

Notes on locust meal as a poultry feed, F. M. Fronda (*Philippine Agr., 24 (1935), No. 5, pp. 425–427*).—A preliminary test using two lots of three chicks each was conducted at the College of Agriculture. The results of the chemical analysis indicated that locust meal could be profitably used as a source of protein for chicks. If used to supply the optimum level of protein it may increase the crude fiber content of the ration beyond a desirable point. Locust meal was not as efficient but was as palatable as fish meal.

The value of cassava refuse meal in the ration for growing chicks, T. T. Tabayoyong (*Philippine Agr., 24 (1935), No. 6, pp. 509–518, fig. 1*).—This work was undertaken at the College of Agriculture to compare the feeding value of cassava refuse meal with rice bran for feeding chicks. For this study three hatches of chicks were divided into three lots of 80, 80, and 47 chicks each.

Chicks fed rice bran grew faster than those fed cassava refuse meal, while chicks fed a combination of the two feeds were intermediate in rate of growth. The chicks fed rice bran consumed the largest amount of feed, while consumption in the other lots was about equal. The cost of feed was highest in the rice bran lot and lowest in the cassava refuse meal lot, while the amount of feed per unit of gain was highest in the cassava refuse meal lot and practically the same in the other lots. The lot fed cassava refuse meal had a mortality of 59.4 percent, the rice bran 41.5 percent, and the lot fed the combination of the two feeds 42.5 percent. The chicks in the rice bran lot were the most uniform in size, while those in the cassava refuse meal lot were the least uniform. Using the rice bran ration as 100, the cassava refuse meal ration was only 77.3 percent efficient, while the combination of the two feeds was 92.3 percent efficient.

The vitamin A requirements of hens for egg production, R. M. Sherwood and G. S. Fraps (*Texas Sta. Bul. 514 (1935), pp. 21*).—This study was conducted to secure further information (E. S. R., 69, p. 95) on the vitamin A requirements of hens and the number of units of vitamin A potency in the feed over maintenance required to produce vitamin A in the eggs. White Leghorn hens were divided into three groups and fed different amounts of vitamin A from yellow corn and dehydrated alfalfa leaf meal.

No significant differences were observed in the weights of the birds in the three groups, but the mortality was greatest in the lot receiving the least vitamin A. In general, the lots receiving the least vitamin A had the lowest egg production, while the highest production was in the lot receiving the most vitamin A. Hatchability was from 33 to 42 percent in the lot receiving the smallest amount of vitamin A, and from 69 to 79 percent in the other lots. The units of vitamin A per gram of feed required for the formation of feathers appeared to be as high as the requirements for egg production. There appeared to be no storage of vitamin A during the molting period.

The apparent percentage of vitamin A recovered in the eggs averaged about 25 percent of that in the feed, but the percentage recovered during different months varied from 8 to 39. The highest apparent recovery was just before or during the period of maximum egg production. On the average, four units in the feed were required for one unit of vitamin A potency in the egg. In this study there appeared to be little gain or loss of vitamin A by the hens, and it was not possible to separate the requirements for maintenance from those for eggs. During periods of heavy laying, hens apparently utilized more than 25 percent of the vitamin A potency in the feed needed for the eggs, leaving some for maintenance. It was estimated that hens producing 150 eggs high in vitamin A per year would require approximately 600 Sherman-Munsell units per day, or 7.5 units per gram of feed. When the vitamin A content of the eggs was disregarded, hens could be kept in good health and production on approximately 240 units of vitamin A per day or 3 units per gram of feed.

The diffusible calcium in the serum of laying and nonlaying hens, M. W. Taylor and W. C. Russell (*Jour. Agr. Res.* [*U. S.*], *51* (*1935*), *No. 7, pp. 663–667*).—The New Jersey Experiment Stations made determinations of the diffusible and nondiffusible calcium in the blood serum of a group of hens before they began to lay and after they began to lay.

By using collodion membranes, it was found that the diffusible calcium of the serum of nonlaying hens was 5.4±0.42 and that of the same hens in laying condition 5.3±0.17 mg per 100 cc of serum. No difference was observed in the level of diffusible calcium when birds changed from a nonlaying to a laying condition and vice versa. The nondiffusible calcium in the serum rose from 6.4±0.53 for nonlaying birds to 16.1±1.17 mg per 100 cc of serum for the same birds in laying condition.

Physiological factors influencing the rate of egg formation in the domestic hen, D. C. Warren and H. M. Scott (*Jour. Agr. Res.* [*U. S.*], *51* (*1935*), *No. 6, pp. 565–572, figs. 2*).—The Kansas Experiment Station made a study of the manner in which variations in the time required for egg formation influenced the time spent by the forming egg in different parts of the hen's oviduct.

It was shown that much of the difference in the absolute length of interval between eggs, the major factor in controlling rate of laying, was due to variations in the time that the egg remained in the uterus. The time spent in the magnum (albumin-secreting section) plus the time between the previous laying and ovulation were only slightly variable and could account for only a small part of the absolute variation in interval length. In low-intensity birds there was also a lengthening of the delay in ovulation of the first egg of a clutch as well as by extending the period required for egg formation.

Flock egg production performance, W. C. Thompson (*New Jersey Stas. Bul. 596* (*1935*), *pp. 20, figs. 8*).—Based on the records of New Jersey egg-laying contests, the author shows how a comparison of the production performance records of each succeeding generation with egg-production standards may be used in an effort to determine the nature and rate of progress toward adopted objectives. The data presented in tables and graphs are based on the records of Single Comb White Leghorns, Barred Plymouth Rocks, and Single Comb Rhode Island Reds.

It is recommended that when the trap-nesting of pullet laying stock is practiced it is desirable at the end of each month or season to compare the distributions of egg yields with the standards given in the text. When flocks are not trap-nested it is desirable to keep daily records of flock yields so that these records can be compared with the standards. Considerable variations in egg-producing capacities exist between individual birds of the same age and flock and also between flocks of the same general line of breeding but within the same breed and variety. These variations will tend to lessen with years of close application of breeding methods and consistent and systematic breeder selection for definite objectives.

The progress of laying batteries, D. C. Kennard and V. D. Chamberlin (*Ohio Sta. Bimo. Bul. 178* (*1936*), *pp. 3–8*).—In this article the authors have brought together the available information on the feeding, management, and behavior of layers in batteries, and have added to this data the results of preliminary work on this subject at the station.

The cold storage of poultry, I, II (*Jour. Soc. Chem. Indus., Trans., 53* (*1934*), *No. 44, pp. 345T–349T, fig. 1*).—Results of investigations at the Low Temperature Research Station at Cambridge University are reported in two parts.

I. *Gas storage of chickens*, E. C. Smith (pp. 345T–347T).—Tests to determine the value of gas for storing table poultry beyond the ordinary storage period practically resulted in failure. The principal cause was autodigestion of the gut and belly wall, which carbon dioxide was unable to inhibit. This limited successful storage to about 8 weeks at 30° to 31° F. Oxidation of the fat occurred after prolonged storage and could be prevented only by maintaining an atmosphere almost completely free of oxygen. In undrawn birds carbon dioxide caused a swelling of the crop and protrusion of the vent, which, without affecting the wholesomeness of the birds, detracted from their market value. In drawn birds the cut muscular surfaces rapidly turned brown in carbon dioxide, and shrinkage, due to drying, made the carcass unsightly.

II. *Chemical changes in the fat of gas-stored chickens*, C. H. Lea (pp. 347T–349T).—In this phase of the investigation, chemical changes in the fat during storage were studied. From the results obtained it was concluded that, while carbon dioxide practically eliminated mold and bacterial spoilage at 0°, autolysis of the tissues by enzymes prevented any great extension of the storage life for undrawn birds. Oxidation of the fat also contributed to spoilage after long storage periods unless the carbon dioxide concentration very closely approximated 100 percent.

DAIRY FARMING—DAIRYING

[Investigations with dairy cattle and dairy products by the Cornell Station] ([*New York*] *Cornell Sta. Rpt. 1935, pp. 73–75, 77, 78, 88–90, 91, 92*).—Studies with dairy cattle yielded information on the toxicity of cod-liver oil to Herbivora, by C. M. McCay, L. A. Maynard, L. L. Madsen, and G. K. Davis; the influence of grain mixtures of different fat levels upon milk secretion, by Maynard, McCay, H. H. Williams, and Madsen; the precursor of milk fat, by Maynard, McCay, R. Melampy, and A. Z. Hodson; effect of ingested fish oils upon the composition of the blood and milk of lactating cows, by McCay, Maynard, G. Davis, Hodson, and Madsen; influence of coconut oil meal and palm-kernel oil meal on the percentage of fat in cow's milk, by E. S. Savage, E. S. Harrison, Maynard, and S. H. Work; and a comparison of concentrate or grain mixtures for dairy cows fed alfalfa hay and corn silage, by Savage, Harrison, and Work.

With dairy products, data were obtained in studies of "oxidized" flavors in milk, by E. S. Guthrie and H. J. Brueckner; milk lipase, by P. F. Sharp and V. N. Krukovsky; stability of beta lactose as influenced by the method of manufacture, by Sharp; chlorides in milk, by Sharp and E. B. Struble; the occurrence of *Streptococcus lactis* in nature, by P. Stark; the growth of aerobic and anaerobic bacteria in relation to free oxygen and the oxidation-reduction potential, by G. Knaysi; and improved methods for the detection of colon organisms in milk and water, by C. N. Stark and L. R. Curtis.

Supplementary report of an experiment to determine the effect of a low calcium ration on reproduction in cattle.—Effects of further reduction in

calcium and of removing vitamin supplements, L. S. Palmer, C. P. Fitch, T. W. Gullickson, and W. L. Boyd (*Cornell Vet., 25 (1935), No. 3, pp. 229–246, fig. 1*).—Continuing this study (E. S. R., 69, p. 258) at the Minnesota Experiment Station, certain of the low calcium cows were continued through one or two further gestations on essentially the same type of ration but reproportioned so that the calcium plane was only about 0.12 percent of the dry matter instead of 0.18 percent. In addition representative animals from each of the groups in the previous study were continued through one or two gestations with the cod-liver oil and tomatoes omitted from their ration.

Three cows that had reproduced normally during 3 yr. on a ration containing an average of 0.18 percent calcium exhibited no abortions attributable to the ration when the calcium content was reduced to 0.12 percent during one or two succeeding gestations. The ration appeared to have no effect on milk and butterfat production or on the chemical composition and clotting properties of the milk, but did result in a slight but definite decline in total and ultrafiltrable calcium in the blood plasma. The mineral content of the muscles of these animals was normal, but the bones had a lower calcium phosphate and calcium carbonate content.

The removal of the cod-liver oil and tomatoes had no effect on breeding efficiency during this trial. The cows seemed to become slightly more susceptible to infections affecting reproduction, but this fact was not conclusively demonstrated. The milk and butterfat production and the chemical composition and clotting properties of the milk was unaffected by the change in ration. A slight but definite decline in the total calcium of the blood plasma occurred, and all groups showed a large decline in ultrafiltrable calcium. The muscle tissues of these cattle showed a normal mineral content, and with the exception of a slightly lower ash and calcium carbonate content, the bones of the cattle showed no effects resulting from the withdrawal of the vitamin supplements.

Feeding the dairy herd, W. B. Nevens (*Illinois Sta. Circ. 440 (1935), pp. 52, figs. 15*).—This is a revised and enlarged edition of Circular 372, previously noted (E. S. R., 65, p. 561).

A comparison of the feeding-values of grass ensiled by the A. I. V.-process and a ration containing mangolds and hay, J. B. E. Patterson (*Empire Jour. Expt. Agr., 3 (1935), No. 10, pp. 144–152, fig. 1*).—This study was undertaken to determine the effect of replacing mangolds and part of the hay in a ration with A. I. V. fodder on the quantity and quality of the milk produced and on the animals themselves. Mature aftermath grass was ensiled by the A. I. V. process.

Chemical analyses of the fresh grass and A. I. V. fodder showed that little change occurred in the protein content, but that the phosphoric acid and calcium content of the silage was lower. When 40 lb. of A. I. V. fodder replaced 40 lb. of mangolds and 5 lb. of hay, the milk production decreased 1.2 lb. per cow per week. The average percentage of butterfat was slightly but not significantly higher, and the color of the butterfat was more than doubled by feeding the A. I. V. fodder. The live weights of the cows fell during the control periods and rose to slightly above the initial weights during A. I. V. feeding.

A combination of fish and kelp meals for the dairy ration, C. F. Monroe, M. A. Bachtell, and C. C. Hayden (*Ohio Sta. Bimo. Bul. 178 (1936), pp. 18–20*).—In order to obtain a further check on the value of Manamar (E. S. R., 73, p. 672), the dairy herd at the Trumbull County Experiment Farm was divided into two groups. One group received the regular grain ration, while the other group was fed the same mixture with part of the cottonseed meal replaced by whitefish meal and kelp. The latter feeds made up 5 and 3 percent, respectively, of the mixture. Both groups received corn silage and alfalfa hay and were on pasture during the grazing season. The rations were fed continuously for approximately 3 yr. and at the end of this period the groups were changed to the opposite rations at their next freshening.

There was no significant difference in the production on the two rations. The total feed consumption, the feed requirements per 100 lb. of 4 percent milk, and the butterfat test were practically equal on both rations. In general, the health history of the cows on the check ration was satisfactory but not perfect. Since the difficulties on the check group were duplicated on the fish meal and kelp ration, it is concluded that the combination was not an absolute preventive of abortions, retained placenta, milk fever, and garget, and that it did not increase breeding efficiency.

Methods of inspecting milk at the receiving platform, J. L. Hileman (*Milk Dealer, 25 (1935), No. 2, pp. 30, 31, 64, 66, figs. 2*).—In this article the author discusses the system of receiving-platform inspection of milk developed by the Dairymen's League Cooperative Association.

Investigation of resazurin as an indicator of the sanitary condition of milk, G. A. Ramsdell, W. T. Johnson, Jr., and F. R. Evans (*Jour. Dairy Sci., 18 (1935), No. 11, pp. 705–717, figs. 2*).—The U. S. D. A. Bureau of Dairy Industry reports the results of 2 years' study on the use of resazurin, a chemical indicator for determining the sanitary condition of milk.

It was found that only 1 hr. was required to complete the resazurin test as described, while the methylene blue test required over 5 hr. On the basis of this test milk can be classified into four groups as regards sanitary condition. Milks from diseased udders and from physiologically abnormal cows have significant effects on the reduction of this indicator, and hence the test aids in their detection. By observing the rate of color change in resazurin-milk mixtures over a period of hours of incubation, much information as to the kind and character of the flora may be obtained.

Nutritional factors of S[treptococcus] lactis, C. S. Mudge and F. R. Smith (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 5, pp. 672–674, fig. 1*).—Using a trilinear chart, the California Experiment Station made a study of the effect of variations in nutrient solutions on the growth of *S. lactis*. The variables tested were peptone, yeast extract, and water. A total of 21 solutions was prepared and adjusted electrometrically to pH 6.5. The media were inoculated with a 0.1 cc of an 18-hour-old milk culture of *S. lactis*, and after 24 hours' incubation at 30° C. the growth was recorded.

From the growth of the organism it was evident that peptone supplied something which was not supplied by water. When a Sörensen citrate buffer of pH 6.5 diluted 1 to 10 was substituted for the peptone, similar growth was obtained. To eliminate the possibilities of the citrate as a source of carbon a N/100 NaH Co_3 solution was used in its place, and again similar growth was obtained. On this basis it is concluded that for *S. lactis*, at least, the peptone in a media serves largely, if not entirely, as a buffer.

The relation of mastitis to rennet coagulability and curd strength of milk, H. H. Sommer and H. Matsen (*Jour. Dairy Sci., 18 (1935), No. 11, pp. 741–749, figs. 2*).—This study at the Wisconsin Experiment Station was undertaken to determine the relation of mastitis to the rennet coagulability and curd strength of milk.

Subclinical mastitis caused the milk to have a lower curd strength and to coagulate more slowly than rennet. This result was obtained when entire milkings from normal and infected udders were compared and when samples from infected quarters were compared with milk from uninfected quarters of the same udder. Corroboration of this finding was also furnished by the relatively greater constancy in the curd strength and rennet coagulation of milk from the four quarters of uninfected udders.

The standardization of the Borden Body Flow Meter for determining the apparent viscosity of cream, J. C. Hening (*Jour. Dairy Sci., 18 (1935), No. 11, pp. 751–756, figs. 2*).—Using the viscometer apparatus previously described (E. S. R., 69, p. 852), the New York State Experiment Station compared results obtained with it with results obtained by using the MacMichael viscometer.

It was found that the Borden Body Flow Meter gave consistent results on the same and on different samples of cream. The accuracy of the apparatus was equally good on creams containing from 20 to 40 percent of fat, using only the large bore tip of 2.78 mm diameter. The same tip and temperature seemed to be satisfactory for the range of fat contents of market creams. Standardization of the apparatus was readily accomplished with sugar solutions, and the seconds of flow showed a straight line relationship to the viscosity in centipoises. These results were applicable to apparent viscosities of creams only up to 25 centipoises, which is the approximate viscosity of 35 to 40 percent cream at 15.6° C. (60° F.). For creams of higher viscosity the apparatus consistently gave results that were too high. However, results on very viscous creams could be transposed to approximate centipoises by the standardizing data secured on cream, making it possible to compare results with data reported in centipoises.

What happens to the cream in paper milk containers? T. Durfee, W. S. Arnott, and P. R. Nelson (*Milk Dealer, 25 (1935), No. 2, pp. 40–42, 60, figs. 2*).—Based on a series of tests with different types of milk containers, the authors concluded that the type of container did have a direct influence on the creaming qualities of the milk. The factor responsible for this reaction was localized in the fat globules.

The vitamin A activity and carotene content of butterfat from Ayrshire, Guernsey, Holstein, and Jersey cows, T. S. Sutton and W. E. Krauss (*Ohio Sta. Bimo. Bul. 178 (1936), pp. 8–13, fig. 1*).—A study was made of the carotene content and vitamin A activity of the butterfat produced by representatives of the Ayrshire, Guernsey, Jersey, and Holstein breeds. All of the cows were fed and handled similarly.

The results indicated that definite breed differences existed both with respect to the amount of carotene and the vitamin A activity per unit of fat produced. Since hay, silage, and pasture furnished practically all of the carotene consumed and it was not possible to keep a record of pasture consumption, the relative carotene intakes were based on silage and hay consumption. No difference was found in the vitamin A activity per unit of fat of Holstein and Guernsey butterfats, but both of these butterfats were significantly superior to Ayrshire butterfat in vitamin A activity. Although the differences between Holstein and Guernsey butterfats and Jersey butterfat were statistically significant in only one trial, the fact that similar differences were observed in each trial indicated that the results were not due to chance. No significant difference was found between the vitamin A activity per unit of fat in Jersey and Ayrshire butterfats. On the basis of these results the vitamin A activity per quart of unstandardized Guernsey milk should exceed that of Holstein milk in direct proportion to the differences in fat percentages. Milk from the Ayrshire breed should contain less vitamin A activity per quart than milk from Guernseys or Holsteins. Unstandardised Jersey milk should exceed unstandardised Ayrshire milk in vitamin A activity because of the larger fat percentage. The authors point out that until more information is known of the vitamin A requirements of humans, any discrimination between breed milks on the above basis alone is questionable.

The relation of the color and carotene content of butter fat to its vitamin A potency, R. TREICHLER, M. A. GRIMES, and G. S. FRAPS (*Texas Sta. Bul. 513 (1935), pp. 34, figs. 3*).—A study was made of the relationship of the carotene content of butter and its vitamin A potency as measured by biological means. The carotene content was measured with a spectrophotometer. Samples of butter from cows used in a study of the vitamin A requirements of dairy cattle (E. S. R., 72, p. 244) were tested, as well as butter from other cows, together with two samples of goat butter.

While on grass pasture Jersey cows secreted rich yellow butterfat, high in carotene content and vitamin A potency, but when removed from pasture there was a decrease in these factors in proportion to the length of time grass was withheld. When fed yellow corn, cows secreted butterfat containing a little more carotene and a little higher vitamin A potency than when fed white corn. However, both factors decreased during a period on yellow corn. Adding 3 lb. of alfalfa leaf meal to the yellow corn ration decreased the loss in these factors, but even 6 lb. of the meal were not sufficient to check the decrease. With sorghum silage as the sole source of vitamin A, the butterfat was pale in color and low in carotene content and vitamin A potency.

The natural yellow color of butterfat was directly proportional to the carotene content of the ration, but the carotene content of the fat was not an accurate measure of the vitamin A potency. The relation between the carotene content and the vitamin A potency depended upon the ration of the cow, the quantities of vitamin A and carotene stored at the beginning of the lactation period, the length of time during which the ration deficient in vitamin A or carotene was fed, the extent of such deficiency, and also upon the individual animal. Cows that had been on a carotene-poor, vitamin-A-deficient ration and were secreting pale butterfats low in these factors began, after only 3 days of 5 hr. each on pasture, to secrete yellow butterfat as high in vitamin A potency but with a carotene content approximately one-third that of butter from cows fed continuously on a diet adequate in carotene.

Goats on green pasture produced nearly white butterfats of low carotene content but high in vitamin A potency. Apparently the goat differed greatly from the cow in ability to convert the carotene of the feed into vitamin A.

The influence of physical and mechanical treatment on the firmness of butter, J. LYONS (*Roy. Dublin Soc. Econ. Proc., 2 (1935), No. 34, pp. 541–558, figs. 2*).—University College, Cork, undertook a series of studies on the extent to which the firmness of butter is affected by various kinds and degrees of treatment.

The results showed that when cream was cooled to a low temperature immediately after pasteurizing the butter made from the cream was much firmer than that made from cream not cooled in this manner. Holding cream at a low temperature for from 2 to 3 hr. gave as firm a butter as holding it for 16 hr. or more at the same temperature. The lower the holding temperature of the cream, the firmer was the resulting butter. When the cream was cooled to a low temperature and held for a sufficient time at that temperature, firmness was not markedly influenced by variations in churning temperature. Low-temperature wash water appeared to have a slight beneficial effect on the firmness of the finished butter. The temperature at which cream was pasteurized by the flash method had little or no influence on firmness, while the fat content of the cream used for churning had no influence on this factor. Underworking or overworking reduced the firmness of the butter. Holding the finished butter at a low temperature had no effect on its firmness. There appeared to be no correlation between the firmness of butter as measured by the Perkins (modified) method and butter judges' score for body and texture when the product was judged at a temperature below 60° F.

Reduction of acetylmethylcarbinol and diacetyl to 2,3-butylene glycol by the citric acid fermenting streptococci of butter cultures, B. W. Hammer, G. L. Stahly, C. H. Werkman, and M. B. Michaelian (*Iowa Sta. Res. Bul. 191 (1935), pp. 377–407, figs. 4*).—The addition of acetylmethyl carbinol or diacetyl to a tomato bouillon culture of one of the citric acid fermenting streptococci normally present in butter cultures resulted in a rapid disappearance of the added reagent and an increase in 2,3-butylene glycol. The amount of glycol produced, in general, accounted for the reagent that disappeared. In trials with acetylmethyl carbinol the change from carbinol to glycol was delayed by the addition of enough sulfuric acid to produce a pH of from 3.8 to 4. When diacetyl was added to a milk culture of one of these organisms there was an increase in acetylmethyl carbinol as well as in the 2,3-butylene glycol, and the increase in carbinol was greater than the increase in glycol. The added reagent did not entirely disappear in any of these tests.

Acetylmethyl carbinol was not produced at the higher pH values when various amounts of sulfuric acid were added to milk cultures of the organism but was produced at the lower values, while 2,3-butylene glycol was produced at both values. The total molarities of acetylmethyl carbinol and 2,3-butylene glycol showed an increase as the pH was lowered. Adding 0.65 percent citric acid to a milk culture of one of the organisms resulted in an increase in both acetylmethyl carbinol and 2,3-butylene glycol. The reduction of acetylmethyl carbinol in a milk culture to 2,3-butylene glycol was not delayed by the amount of potassium nitrate added, but was delayed by the largest amount of hydrogen peroxide used in these tests. The addition of acetaldehyde or propionaldehyde to a culture acidified with sulfuric acid to about pH 3.9 increased the amount of acetylmethyl carbinol present after 96 hr. at 21° C., but decreased the amount of 2,3-butylene glycol and also commonly decreased the total molarities of the two compounds.

In butter cultures a decrease in acetylmethyl carbinol was accompanied by an increase in 2,3-butylene glycol, and there was commonly an increase in the total molarities of the two. Neutralizing ripened butter cultures to a low acidity resulted in a rapid decrease in acetylmethyl carbinol, which in some cases was followed by an increase. Hydrogen peroxide, in certain concentrations, delayed the reduction of acetylmethyl carbinol as did also 1 percent sodium fumarate or 12 percent sodium chloride. Ice water temperatures delayed the reduction in either neutralized or unneutralized cultures, but the reduction was more rapid with neutralization.

The diketone produced when butter cultures are steam distilled with ferric chloride added, B. W. Hammer (*Jour. Dairy Sci., 18 (1935), No. 11, pp. 769–771*).—At the Iowa Experiment Station it was found that the percentages of nickel in the various salts prepared from butter cultures ranged from 20.14 to 20.3. All of the values were close to the theoretical for nickel dimethylglyoximate and distinctly higher than the theoretical values for the higher homologues. A commercial preparation of diacetyl contained an average nickel content of 20.3 percent. Adding citric acid to the milk used in preparing butter cultures had no effect on the nickel content of the salts.

The data indicated that the diketone steam distilled from butter cultures after the addition of ferric chloride was diacetyl rather than one of the homologues, and that if homologues were present they were limited to relatively nonsignificant amounts.

Bacteriology of cheese.—II, Effect of Lactobacillus casei on the nitrogenous decomposition and flavor development in Cheddar cheese made from pasteurized milk, C. B. Lane and B. W. Hammer (*Iowa Sta. Res. Bul. 190 (1935), pp. 337–376*).—Continuing this investigation (E. S. R., 73, p. 535), this work was conducted with nine series of cheese, using eight strains of the organism. In each series there were three cheeses made from the same lot of milk. One cheese in each of six series was made from raw milk, one from pasteurized milk, and one from pasteurized milk inoculated with a strain of *L. casei*, while with each of three series one cheese was made from pasteurized milk and two from similar milk inoculated with *L. casei*. Chemical analyses were made of the cheese serum, and the cheeses were scored for flavor.

There was a steady breaking down of the protein in all the cheese, and six of the strains of *L. casei* used appeared to bring about a more rapid and extensive decomposition of the protein than occurred in cheese made from uninoculated milk. The other two strains of *L. casei* had little effect on the rate or extent of protein decomposition. Except for the fraction insoluble in trichloroacetic acid, the amounts of the various forms of nitrogen obtained from the serums of the raw-milk cheese and cheese made from pasteurized milk inoculated with one of the six strains were usually larger than the corresponding amounts obtained from the serum of pasteurized-milk cheese. This was especially true in the case of total nitrogen and nitrogen soluble in trichloroacetic acid. The amount of nitrogen insoluble in trichloroacetic acid was commonly larger in the serum of the pasteurized-milk cheese. The percentages of the fraction of total nitrogen soluble in trichloroacetic acid but not in ethyl alcohol were usually larger in the serums of raw-milk cheese and cheese made from inoculated pasteurized milk than in the serum of the pasteurized-milk cheese.

The flavor scores of cheese made from pasteurized milk inoculated with *L. casei* were usually higher and more uniform that the scores of either raw- or pasteurized-milk cheese, although the flavor was not always typically Cheddar. Three strains of the organism gave a Cheddar flavor, while three others produced a pleasing butter flavor and aroma. Small amounts of diacetyl were obtained from these latter cheeses. The raw-milk cheese generally had a typical Cheddar flavor, while the pasteurized-milk cheese usually scored comparatively low and was lacking or bitter in flavor.

During the entire ripening period the bacterial counts on the cheese made from pasteurized milk inoculated with *L. casei* were considerably higher than counts on the other two types of cheese. The flora of the cheese made with *L. casei* was made up largely of this organism at all stages of ripening, while in the other types of cheese *L. casei* organisms were not very numerous until the later stages of ripening.

It is concluded that, in general, certain strains of *L. casei* when added to pasteurized milk appeared to have a desirable effect on the protein decomposition, the flavor, and the uniformity of the resulting cheese.

A gas defect of cream cheese, W. J. Corbett, W. J. Frazier, and W. V. Price (*Milk Dealer, 25 (1935), No. 3, pp. 38, 39*).—In this article from the Wisconsin Experiment Station, the authors discuss the results of a preliminary investigation of gas formation in cream cheese marketed in small glass jars. Plate and microscopic smears showed yeasts, cocci, and rods to be present in all defective cheese. Of the yeast cultures isolated, only six were able to produce gas on artificial media, and these belonged to the lactose-fermenting group of the genus *Saccharomyces*. The defect was more severe commercially in cream cheese flavored with such materials as ground pimientos, sweetened crushed pineapple, or sweet-pickle relish than in the unflavored cheese. Tests indicated that the amount of gas produced by the addition of flavoring materials might be attributed to the fermentable carbohydrates they contained, and that this type of gas defect was probably not due to either the anaerobic or the aerobic bacteria present.

Sweet-curd cottage cheese: Directions for manufacturing with an enzyme, P. H. Tracy and H. A. Ruehe (*Illinois Sta. Circ. 445 (1936), pp. 12, figs. 6*).—In this publication the authors discuss the factors relating to quality of sweet-curd cottage cheese, give directions for two methods of making this cheese, and describe the causes of common body defects, the effect of light rays on the flavor of the cheese curd, and the packaging of cottage cheese.

Moldiness in Romano cheese, F. W. Fabian and J. W. Severens (*Jour. Dairy Sci., 18 (1935), No. 11, pp. 773–775*).—An investigation of mold development in the center of Romano cheese at the Michigan Experiment Station indicated that the moisture content would have to be approximately 25 percent and the salt content not greater than 6 percent to permit mold growth to take place. On this basis it seemed advisable in making this type of cheese not to punch holes in the product in order to facilitate the penetration of brine into the interior. Such a procedure appears to permit molds to grow in the center of the cheese, since every cheese so treated in the factory under observation developed molds there.

The bacteriology of Swiss cheese.—IV, Effect of temperature upon bacterial activity and drainage in the press, L. A. Burkey, G. P. Sanders, and K. J. Matheson (*Jour. Dairy Sci., 18 (1935), No. 11, pp. 719–731, figs. 2*).—Continuing these investigations (E. S. R., 74, p. 97), the temperature, pH, and bacterial counts were determined in cheeses in the press at regular intervals from dipping to 21 hr. in samples taken at definite distances from the outer edge of the cheese. Results were obtained from tests on 55-lb. laboratory cheeses and on large factory cheeses.

It was found that the area just beneath the rind cooled more rapidly than the interior. Bacterial growth and acid production corresponded in general with the decrease in temperature of each part of the cheese. The starter temperature began to increase in numbers in the area 1 in. beneath the rind during the first few hours after dipping, but the initiation of growth in the interior occurred at the following intervals of time from dipping: *Streptococcus thermophilus* (C3) within 2 or 3 hr., *Lactobacillus bulgaricus* (Ga and 39aH) after 5 or 6 hr., and *L. helveticus* (39a) after 9 or 10 hr.

The essential function of *S. thermophilus* in the cheese in the press was the production of acid and the consequent facilitation of drainage from the interior during the first 4 to 6 hr. after dipping. Large differences in the pH of the interior and the area just beneath the rind resulted in insufficient drainage and high moisture content. This condition tended to cause such defects as checking near the rind or a splitting of the curd known as "glass."

The bacterial content of cheese cloths did not influence the rate of acid production near the surface of the cheese. In order to obtain samples representative of the interior of the cheese they should be taken at least 3 or 4 in. from the hoop edge. The judicious use of starters promoted sufficient acid production throughout the cheese and aided in uniform drainage.

The age thickening of sweetened condensed milk.—I, Seasonal variations, V. C. Stebnitz and H. H. Sommer (*Jour. Dairy Sci., 18 (1935), No. 11, pp. 757–768, figs. 2*).—The Wisconsin Experiment Station undertook a study of the factors involved in the thickening of sweetened condensed milk during storage. One type of this thickening was found to be most prevalent during the late spring and early summer. This type, known as "age thickening", was not accompanied by the spoilage of the product, but the heavy body was objectionable from the standpoint of the consumer.

In the region of Madison the unstable period for sweetened condensed milk began very abruptly and occurred at any time from the middle of April to the middle of May. The change back to the stable condition occurred more slowly and took place during the latter part of June and July. The freshening of the cows or the time in which they were turned out on grass could not be directly correlated with the period during which this defect occurred.

Technical control of ice cream with sodium alginate, C. Goodman (*Ice Cream Rev., 18 (1935), No. 7, pp. 42–44, 48, figs. 3*).—Tests with sodium alginate as a stabilizer in ice cream showed that it improved the texture, retarded coarsening, improved the whipping ability of the mix, and gave a creamy consistency to the finished product. Sodium alginate is tasteless and for all practical purposes free from bacteria. Because it is prepared from a chemical compound of definite composition, it is not subject to variations in efficiency or strength.

Compressing hardened ice cream, O. E. Williams (*Ice Cream Rev., 18 (1935), No. 9, pp. 37, 61*).—The U. S. D. A. Bureau of Dairy Industry has found that it is possible to compress low-density ice cream to the desired density by applying great pressure to the hardened product with a hydraulic press. This method of obtaining the correct density avoids the undesirable effects resulting from attempts to reduce the air content of the mix in the freezer by lowering the temperature of the brine or by prolonging the freezing period.

A study of the insulating efficiency of ice cream packers, B. J. Reiger and E. H. Luttropp (*Ice Cream Rev., 18 (1935), No. 9, pp. 38–42, figs. 2*).—This study was undertaken at the Idaho Experiment Station to determine the insulating efficiency of 10 representative kinds of insulated packers for ice cream. Five-gal. cans were filled with crushed ice, drained for 5 min., and then placed in the respective packers. The packers were placed in a controlled temperature room for 24 hr., when the water was drained off and the amount of melted ice determined. In one test dry packers were observed at temperatures of 50°, 70°, and 90° F. In a second test the packers were soaked for 48 hr. and then tested at 90°. In the third trial packers were dried at 110° to 120° for 4 weeks and again tested at 90°.

The most efficient insulating material used was hair insulating felt. When wet the insulating efficiency of this material was consistently reduced. Ground cork ranked high as an insulator either when wet or dry, but soft pulp fiber was not a very efficient material. Waterproof packers had a distinct advantage over nonwaterproof packers under moist conditions and when wetting was apt to occur. When dry, however, the waterproof packers were less efficient and heavier than the nonwaterproof packers. Soaking the packers reduced their efficiency, required several weeks to dry them, and they were never as efficient again.

The significance of the presence of Escherichia-Aerobacter groups of bacteria in ice cream, A. C. Fay (*Ice Cream Rev., 18 (1935), No. 7, pp. 38, 39*).—At the Kansas Experiment Station it was found that in the bacteriological examination of ice cream samples the colon count gave in a general way the same information conveyed by the plate count. The colon count alone failed to detect some of the samples with high plate counts. This count gave insufficient advantage over the plate count to justify its use in routine analysis, although it could be used advantageously in special cases.

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[Contributions on animal bacteriology and pathology] (*Jour. Bact., 31 (1936), No. 1, pp. 6, 7, 15, 16, 25, 26, 37, 38, 42, 43, 47, 48–51, 55, 56, 74, 75, 81, 82, 83, 84, 85, 88, 89*).—Contributions presented at the annual meeting of the Society of American Bacteriologists held in New York City in December 1935, abstracts of which are given, include the following: Effectiveness of Hot Hypochlorites of Low Alkalinity in Destroying *Mycobacterium tuberculosis*, by S. M. Costigan, J. W. Yates, W. A. Hadfield, and E. C. McCulloch (p. 6); The Similarity Between the Specificities of Disinfectants Against a Filtrable Virus and Gram Negative Organisms, by E. C. McCulloch (p. 7); Metabolic Activity and Cell Volume of *Salmonella gallinarum* at Various Phases of the Culture Cycle, by E. Huntington (pp. 15, 16); Distribution of *Escherichia coli* in Cold-Blooded Animals, by A. A. Hajna and C. A. Perry (pp. 25, 26); The Immunological Relationship Between the Viruses of Human and Swine Influenza, by T. Francis, Jr. (p. 37); The Susceptibility of Swine to the Virus of Human Influenza, by R. E. Shope (p. 37); Interstitial Pneumonia in Mice, by P. H. Long and E. A. Bliss (pp. 37, 38); The Action of Formolized Virus as a Preventive of Experimental Equine Encephalomyelitis in Guinea Pigs, by H. R. Cox and P. K. Olitsky (p. 38); Increase in Toxicity Due to Action Upon the Broth Constituents by Endo-enzymes of the *Salmonella* Bacteria, by F. L. Kraft and C. N. Stark (pp. 42, 43); The Antigenic Relationships of *Salmonella aertrycke* var. *binns*, by P. R. Edwards (p. 43), contributed from the Kentucky Experiment Station; Relationship of Sarcoma to Leukosis of Chickens, by J. Furth (pp. 47, 48); A Fatal Virus Disease in Ferrets, by C. A. Slanetz, H. Smetana, and A. R. Dochez (pp. 48, 49); Immunological and Serological Evidences of a Close Relationship Between the Viruses of Rabbit Fibroma (Shope) and Infectious Myxomatosis (Sanarelli), by G. P. Berry and J. A. Lichty, Jr. (pp. 49, 50); A Method for Changing the Virus of Rabbit Fibroma (Shope) Into That of Infectious Myxomatosis (Sanarelli), by G. P. Berry and H. M. Dedrick (pp. 50, 51); Inhibition of *Staphylococcus* Bacteriophage and the Virus of Vesicular Stomatitis, by M. L. and T. L. Rakieten and S. Doff (pp. 55, 56); Human Sensitization to the Purified Protein Derivative of the Avian Tubercle *Bacillus*, by J. McCarter, H. R. Getz, and R. H. Stiehm (pp. 74, 75); A Comparative Study of Human and Avian Strains of *Staphylococcus albus*, by C. S. Gibbs (p. 81), contributed from the Massachusetts Experiment Station; Serologic Grouping of Staphylococci, by J. E. Blair and F. A. Hallman (pp. 81, 82); An Epizootic Septicemia of Young Guinea Pigs Caused by *Pseudomonas caviae* n. sp., by M. Scherago (p. 83); Investigation of a Milk-Borne Epidemic of *Staphylococcus* Food Poisoning, by H. J. Shaughnessy and T. C. Grubb (pp. 84, 85); and Observations on Staphylococci Associated With Bovine Mastitis, by W. N. Plastridge, F. J. Weirether, and L. F. Williams (pp. 88, 89), contributed from the [Connecticut] Storrs Experiment Station.

[Contributions on animal parasites] (*Helminthol. Soc. Wash. Proc., 2 (1935), No. 2, pp. 69, 76, 80, 83–90, 92, figs. 2*).—Contributions presented (E. S. R., 72, p. 213) include the following: *Cephenomyia pratti* (Diptera: Oestridae) Reared from Blacktailed Deer [*Odocoileus hemionus*], by W. L. Jellison (p. 69); A Note on the Life History of *Echinostoma coalitum* Barker and Beaver 1915 (Trematoda: Echinostomatidae), by W. H. Krull (p. 76); New Host Records of Parasites, by A. McIntosh (p. 80); Parasites of Cattle in Costa Rica, by G. Dikmans (p. 83); New Records of Nematode Parasites From Deer in the United States, by G. Dikmans and J. T. Lucker (p. 83); A Note on the Identity of *Cooperia punctata* Ransom 1907 and *C. fieldingi* Baylis 1928 (Nematoda: Trichostrongylidae) (p. 84) and A Note on *Protostrongylus* *stilesi* (Nematoda: Metastrongylidae) From the Mountain Sheep (*Ovis canadensis*) in Yellowstone National Park, Wyoming (p. 84), both by G. Dikmans; A Revised Classification of the Nematode Superfamily Filarioidea, by E. E. Wehr (pp. 84–88); A Note on the Morphology of the Anterior Ends of the Infective Larvae of Some Nematodes Parasitic in the Alimentary Tract of Sheep (pp. 88–90) and A Second Report of the Occurrence of *Trichostrongylus longispicularis* in Cattle in the United States (p. 90) (E. S. R., 71, p. 808), both by J. S. Andrews; and The Cestode *Hymenolepis microps* (Hymenolepididae) in Ruffed Grouse (*Bonasa umbellus*), by M. F. Jones (p. 92).

Report on the Department of Animal Health for the year 1934–35, J. L. Stewart (*Gold Coast Dept. Anim. Health Rpt., 1935, pp. 35, pl. 1*).—Part 2 of this contribution deals with the occurrence of and control work with infectious diseases of livestock (pp. 6–12); part 3 with laboratory work on serum and vaccine for antirinderpest, contagious bovine pleuropneumonia vaccine, fowl cholera, spirochetosis of poultry, tick-borne protozoal diseases, trypanosomiasis and tsetse flies, eradication of tsetse fly, etc. (pp. 12–22).

Ninth report of the Government Institute for Veterinary Research ([*Chosen*] *Govt. Inst. Vet. Res. Rpt., 9 (1934), pp. 85, pls. 3; Eng. abs., pp. 1–6, 13, 14, Ger. abs., pp. 7–12*).—The contributions presented in this report (E. S. R., 70, p. 676) include 15 articles previously noted, together with the following: Variations of Plasma Protein Fractions and Their Distribution During Rinderpest, by S. Nagahata and S. Ikegaya (p. 3), and On a Trematode Parasite, *Echinostoma revolutum* (Frölich 1802), From a Corean Wild Duck, by O. Isshiki (p. 14).

A course in histopathology, O. Seifried (*Lehrgang der Histopathologie für Studierende und Tierärzte. Berlin: Julius Springer, 1934, pp. VIII+195, figs. 142*).—Part 1 (pp. 2–47) deals with general, part 2 (pp. 48–162) with special, and part 3 (pp. 163–184) with comparative histopathology.

Clinical parasitology and tropical medicine, D. and C. T. de Rivas (*Philadelphia: Lea & Febiger, 1935, pp. 367, pl. 1, figs. 144*).—Part I of this work is devoted to general considerations, part 2 to diseases caused by Protozoa, part 3 by Metazoa, part 4 by bacteria, part 5 to those of undetermined etiology, and part 6 to climatic diseases and animal poisons.

Laboratory methods of the United States Army, edited by J. S. Simmons and C. J. Gentzkow (*Philadelphia: Lea & Febiger, 1935, 4. ed., [rev.], pp. XIX+1091, figs. 70*).—Part 1 of the fourth edition of this work (E. S. R., 39, p. 786), which has been prepared with the assistance of 18 contributors, deals with the clinical pathology (pp. 1–235), part 2 with chemistry (pp. 237–536), part 3 with mycology (pp. 537–555), part 4 with bacteriology (pp. 557–792), part 5 with rickettsiae and filtrable viruses (pp. 793–822), part 6 with protozoology (pp. 823–890), part 7 with helminthology (pp. 891–906), part 8 with entomology (pp. 907–934), part 9 with pathology (pp. 935–971), part 10 with special veterinary laboratory methods (pp. 973–1001), and part 11 with statistical methods (pp. 1003–1041).

Hypersensitivity in domestic animals: A review, A. Zeissig (*Jour. Amer. Vet. Med. Assoc., 88 (1936), No. 2, pp. 139–153, figs. 2*).—A review of the subject presented with a list of 15 references to the literature.

The nature of bacteriophage and its mode of action, A. P. Krueger (*Physiol. Rev., 16 (1936), No. 1, pp. 129–172, fig. 1*).—This contribution is presented with a seven-page list of references to the literature.

Comparative productivity tests of presumptive test media with pure cultures of the coli-aerogenes group, M. A. Farrell (*Jour. Bact., 30 (1935), No. 4, p. 445*).—A comparison made of test media indicates that standard lactose broth is the most productive for cultures of the coli-aerogenes group. Giving this medium a value of 100 and calculating the sensitivity of the other media in terms of lactose broth positives, the folowing values were determined: Fuchsin lactose broth 98.5 percent, brilliant green lactose bile 94.2, and buffered lactose broth 92 percent. The remaining five media showed less than 85 percent the productivity of standard lactose.

Results of the treatment of anaplasmosis and foot-and-mouth disease with trypaflavine [trans. title], M. van Zwieten (*Nederland. Indische Bl. Diergeneesk., 47 (1935), No. 5, pp. 263–269; Ger., Eng. abs., p. 269*).—The intravenous administration of trypaflavine (1:50) to 20 water buffaloes and 104 cows proved successful in the treatment of anaplasmosis. It was also administered with success in the treatment of foot-and-mouth disease in dairy cows.

Bacteriological differentiation of Brucella forms [trans. title], P. G. Bruschettini (*Rev. Prat. Malad. Pays Chauds, 15 (1935), Nos. 10, pp. 441, 442, 445–448, 451, 452, 455, 456, 459–462, 465, 466, 469–472; 11, pp. 480–486, 489–490, 493, 494*).—This contribution is presented with a list of 84 references to the literature.

Paralytic rabies in livestock, H. V. M. Metivier (*Jour. Compar. Path. and Ther., 48 (1935), No. 4, pp. 245–260, figs. 7*).—This contribution deals with the history of the disease in Trinidad, distribution in other countries, cause, transmission, symptoms, pathology, diagnosis, and treatment.

The study and control of paralytic rabies transmitted by bats in Trinidad, British West Indies, E. de Verteuil and F. W. Urich (*Roy. Soc. Trop. Med. and Hyg. Trans., 29 (1936), No. 4, pp. 317–347, pls. 4, figs. 7*).—The authors' studies have shown paralytic rabies to exist on a fairly large scale among animals in Brazil and in Trinidad, although the human form of the disease has been reported only from Trinidad, and to a very limited extent, the vampire bats (*Desmodus* spp., particularly *D. rufus* and *D. rotundus*) being the only known vectors. They have found the control of the disease to depend to a large extent upon the control of the vampire bat population in the affected areas, although the possible relation of fruit-eating and other bats to the spread of the disease appears to require further investigation. Effective methods of destruction of the vampire and other bats have been worked out in Trinidad and should prove to be of value elsewhere.

Avian itch mites as a cause of human dermatoses: Canary birds' mites responsible for two groups of cases in New York, M. B. Sulzberger and I. Kaminstein (*Arch. Dermatol. and Syphilol., 33 (1936), No. 1, pp. 60–72, fig. 1*).—Five cases are reported in which the dermatosis was caused by the chicken mite from pet canary birds.

Chemotherapy of the piroplasmoses by a new medicament, Acaprine (Bayer) (the methylsulfomethylate of the urea of 6-aminoquinoline) [trans. title] (*Bul. Soc. Path. Exot., 28 (1935), No. 9, pp. 793–811*).—A therapeutic study of Acaprine has shown it to be a specific for all forms of piroplasmosis occurring in Rumania when administered subcutaneously or intramuscularly, and that it is more active than trypan blue or even trypaflavine. That it does not stain the tissues of the treated animal or the hands of the attendant is considered to be a particular advantage.

Part 1 reports upon its use in the treatment of equine piroplasmosis due to *Piroplasma caballi* (Nuttall and Strickland) (pp. 796–801) and part 2 in the treatment of bovine babesiasis due to *Babesiella bovis* (Babes) (pp. 801–803), both by C. Cernaianu and N. Gluhovschi, part 3 in the treatment of the bovine piroplasmosis due to *P. bigeminum* (Smith and Kilborne), by C. Cernaianu, I. Radef, and T. Radescu (pp. 804–806), and part 4 in the treatment of ovine babesiasis due to *B. ovis*, by C. Cernaianu, I. Schuldner, and F. Magureanu (pp. 806–811).

Studies on the etiology of rabbit pox, I–IV (*Jour. Expt. Med., 63 (1936), Nos. 2, pp. 241–258, pl. 1, fig. 1; 259–276, pls. 3; 3, pp. 353–378, pls. 2; 379–396, pl. 1*).—In continuation of the studies on rabbit pox (E. S. R., 74, p. 108), part 1 of this contribution, by L. Pearce, P. D. Rosahn, and C. K. Hu, deals with the isolation of a filtrable agent and its pathogenic properties; part 2, by P. D. Rosahn, C. K. Hu, and L. Pearce, with the clinical characteristics of the experimentally induced disease; part 3, by C. K. Hu, P. D. Rosahn, and L. Pearce, with tests of the relation of rabbit pox virus to other viruses by crossed inoculation and exposure experiments; and part 4, by P. D. Rosahn, C. K. Hu, and L. Pearce, with tests on the relation of rabbit pox virus to other viruses by serum neutralization experiments.

Effect of low temperature upon trypanosomes (Trypanosoma equiperdum) in mammals, N. KALABUCHOV and L. LEVINSON (*Nature [London], 136 (1935), No. 3440, p. 553*).—In temperature experiments with bats infected with *T. equiperdum* the parasites completely disappeared from the blood after the bats had been exposed to temperatures of +3° and +10° C. for from 3 to 8 days, and did not reappear when the body temperature was raised to from 33° to 37°.

A natural infection of Trypanosoma hippicum Darling in the vampire bat (Desmodus rotundus murinus Wagner), C. M. JOHNSON (*Amer. Jour. Trop. Med., 16 (1936), No. 1, pp. 59–62*).—The first case of a natural infection with *T. hippicum* in *D. rotundus murinus* is reported. This strain of trypanosomes caused the usual type of disease (which terminates fatally), when inoculated into laboratory animals and a horse. Attempts to transfer the infection by feeding the bat on guinea pigs were unsuccessful. This bat is the seventh one studied which recovered from the infection.

Trypanosomiasis of stock in Mauritius, I, II, A. R. D. ADAMS (*Ann. Trop. Med. and Parasitol., 29 (1935), Nos. 1, pp. 1–18, figs. 2; 4, pp. 475–481, fig. 1*).—Part 1 consists of an account of *Trypanosoma vivax*, a parasite of stock in Mauritius, and part 2 of observations on the incidence and distribution of trypanosomiasis in cattle.

The influence of the ultra-violet light on the development of the eggs of parasitic worms: Parascaris equorum, syn. Ascaris megalocephala, Enterobius vermicularis, and Strongylus equinus, L. G. SHALIMOV (*Trudy Din. Razv. [Moskva] (Trans. Dyn. Devlpmt.), 10 (1935), pp. 447–461, figs. 5; Eng. abs., p. 461*).—The author has found the ultraviolet rays to exert a ruinous influence on the development of the eggs of helminths. "A 5-min. irradiation with a quartz mercury vapor lamp at a distance of 50 cm has a lethal effect with regard to all the eggs of *P. equorum* and *E. vermicularis*; a 3-min. irradiation has the same effect with regard to the eggs of *S. equinus*. The influence of the ultraviolet light is not instantaneous; apparently a certain period of time is required until it stops the development of the egg and provokes its perishment. The application of the ultraviolet light causes very complicated physicochemical processes which result in an irregular division, disproportionate distribution of the plasm, unnatural development, and plasm coagulation. Apparently a partial and local influence of the ultraviolet rays causes unnatural development.

"*P. equorum* eggs in the stage of a mobile larva as big as 1.5 ring become highly resistant against the ultraviolet light and can stand irradiation for 25 min. at least. Colored filters, as urine, dung infusion, methylene blue (morilka), protect the eggs from the ultraviolet light and therefore decrease the practical value of the quartz mercury vapor lamps in the struggle against helminths. The efficiency of the quartz mercury vapor lamp changes according to the condition of the lamp; the greater the intensity of the lamp, the higher the ruinous effect of the light. The practical application of the ultraviolet light sources, may it be quartz mercury vapor lamp, a volt arc, or any other source, must take place in the struggle against parasite invasions, especially under the conditions of communal life. A particularly great application of the sources of the ultraviolet rays may take place in the struggle against enterobiosis."

On the migration of Trichinella larvae, M. Geller (M. R. Heller) (*Trudy Din. Razv.* [*Moskva*] (*Trans. Dyn. Devlpmt.*), *10* (*1935*), *pp. 433–446*; *Eng. abs., p. 446*).—The conclusion that the chief manner of distribution of *Trichinella* is hematogenous is considered confirmed by the presence of larvae in the blood and lungs of infected animals and by experimental injection of mature trichina into the blood vessels.

The comparison of the efficiency of anthelmintics, W. A. Carr Fraser (*Parasitology, 27* (*1935*), *No. 4, pp. 465–475*).—The author's study has led to the suggestion of a method whereby the mean efficiency of a drug or mixture of drugs can be assessed in terms of the initial and residual infestation of selected animals.

Methods of testing the anthelmintic properties of ascaricides, P. D. Lamson and H. W. Brown (*Amer. Jour. Hyg., 23* (*1936*), *No. 1, pp. 85–103, fig. 1*).—An in vitro method for the testing of anthelmintics against *Ascaris* is described, and various methods of testing anthelmintic activity in animals and man are reviewed. The authors are of the opinion that "both in vitro and animal in vivo anthelmintic tests are of great aid in determining the probable action of a drug in man. In vivo anthelmintic tests in animals, as those on dog *Ascaris*, in testing a human ascaricide are simple and usually effective. The maintenance of large numbers of dogs is, however, very expensive. In vitro tests, on the other hand, are inexpensive and allow observation of the effect of drugs on the worm which cannot be carried out in vivo. In vitro methods are of great value for orientation experiments, especially where a large series of related compounds are to be studied. The final test of any anthelmintic is its action against that parasite in which one is interested in its normal host."

A list of 41 references to the literature is included.

Jowar (Sorghum vulgare) poisoning in cattle, G. K. Sharma (*Indian Jour. Vet. Sci. and Anim. Husb., 5* (*1935*), *No. 4, pp. 376–380*).—A brief summary of information on poisoning by *S. vulgare*, with a list of 13 references to the literature.

Mescalbean (Sophora secundiflora) poisonous for livestock, I. B. Boughton and W. T. Hardy (*Texas Sta. Bul. 519* (*1935*), *pp. 18, figs. 2*).—This is a summary of information on the leguminous shrub or small tree *S. secundiflora* (commonly known as the mescalbean, mountain-laurel, or coralbean), which is sometimes a source of poisoning during the late fall and winter months on ranches in parts of the Edwards Plateau region of west Texas.

Experiments have shown that goats, like sheep, suffer from a benign type of poisoning, while cattle are extremely susceptible and die within a few hours after eating relatively small amounts of the leaves. The experimental feeding tests indicate that the mature fresh leaves during the late fall and winter months are much more toxic than are the young fresh leaves during the spring months. "There is decided variation in the susceptibility of individual animals to the poisoning from eating the leaves. Feeding tests show that amounts of leaves greater than range sheep or goats ever eat are insufficient to cause death. While cattle are very susceptible, it is seldom that they will eat enough leaves on the range to produce fatal results. Contrary to general opinion, ingestion of a relatively large amount of the ripe ground-up seeds is required to cause fatal poisoning in sheep. In unbroken seeds the hard covering prevents digestion of the seed and, for all practical purposes, obviates the danger of poisoning resulting from their ingestion by range animals."

Toxicology of selenium, I, II, H. C. Dudley (*Amer. Jour. Hyg., 23 (1936), No. 1, pp. 169–186*).—Two papers are here presented.

I. *A study of the distribution of selenium in acute and chronic cases of selenium poisoning* (pp. 169–180).—In feeding experiments with inorganic and organic selenium compounds selenium was found to be distributed throughout the whole organism but in widely varying proportions. "In general, the liver, kidneys, and spleen of animals in the acute stage of the poisoning carry the greater amounts of selenium, concentrations ranging from 4–25 p. p. m. In chronic cases of similar nature the selenium is found predominantly in the liver and kidneys (3–25 p. p. m.). Concentrations of 8–20 p. p. m. have been found in the hoofs of a variety of chronic cases. The presence of selenium in the blood in amounts from 7 to 27 p. p. m. denotes that it is transported by this medium to all parts of the body. It is, however, deposited predominantly in certain organs, viz, the liver, kidney, and spleen, which show a high content of the element. Apparently the hepatic and renal pathways are mainly responsible for elimination of the toxic material.

"A proteinlike selenium complex is present in the blood corpuscles of a horse receiving sodium selenite as an addition to the regular ration. The selenium in the urine of this animal is present as an ether-soluble, volatile compound."

II. *The urinary excretion of selenium* (pp. 181–186).—This further contribution reports upon the urinary excretion of selenium by the human body.

Observations on certain unidentified acid-fast bacteria obtained from cattle, W. H. Feldman (*Jour. Amer. Vet. Med. Assoc., 88 (1936), No. 2, pp. 166–172*).—In a study of the behavior in vivo of certain strains of acidfast bacteria that had been obtained from cattle devoid of lesions of genuine bovine tuberculosis, a series of white mice were inoculated intraperitoneally with saline suspensions prepared from eight strains. Seven of these strains were definitely and consistently acidfast, while in one this character was inconstant.

"The bacterial cultures used consisted of *M[ycobacterium] tuberculosis (bovis)* and *M. tuberculosis (hominis)*, one strain each; *M. tuberculosis (avium)*, two strains; *M. phlei* (timothy grass bacillus), one strain; cultures isolated from tuberculoid lesions (so-called 'skin lesion') of cattle, two strains, and one strain obtained from a mesenteric lymph node of a cow."

The observations "indicate that the bacteria studied, other than those which originated from cases of true tuberculosis, possessed features in common with the saprophytic acidfast organisms. While they possess certain cultural and other biologic differences, the failure to provoke convincing evidence of pathogenicity should make one cautious in subscribing to their etiologic significance in the spontaneous production of disease."

Acute amphistomiasis of cattle in Assam.—A preliminary report, P. G. Pande (*Indian Jour. Vet. Sci. and Anim. Husb., 5 (1935), No. 4, pp. 364–375*).—An outbreak of disease among cattle in certain villages of the Kamrup district in Assam in October 1934, in which 60 percent of the affected animals succumbed, was found upon investigation to be acute amphistomiasis. The disease is said to start immediately after the rains and to alternate with rinderpest in its occurrence. "Emaciation and diarrhea constitute the main clinical features of the disease, the rate of mortality varying from 30 to 40 percent. The snails *Viviparus bengalensis* and *Limnaea acuminata* are the possible intermediate hosts of the parasites of acute amphistomiasis. The essential lesion is that of catarrhal enteritis, the immature amphistomes being intimately connected with the lesion. The immature amphistomes recovered from the lesion have been classified as belonging to the genus *Paramphistomum*, which take more than 2 mo. to attain maturity and reach their normal habitats by migration."

No reference has been found to an earlier occurrence in India.

The diagnosis of anaplasmosis in a herd of cattle [trans. title], I. García (*Inst. Biol. Anim.* [*Spain*], *Trab.*, *2* (*1934*), *pp. 88–106, figs. 8; abs. in Vet. Rec.*, *15* (*1935*), *No. 18, p. 537*).—An outbreak of anaplasmosis in a herd of 17 bovines, in which 12 became affected, cases appearing at intervals of about 30 days and lasting from 10 to 80 days, is reported upon.

The occurrence of bovine babesiellosis in northern Australia, J. Legg (*Aust. Council Sci. and Indus. Res. Pam. 56* (*1935*), *pp. 48, pls. 4, figs. 9*).—An account is given of experimental work with the bovine babesiasis in northern Australia caused by an organism which morphologically resembles, and is probably identical with, *Babesiella agentinum* Lignières (1903) and *B. berbera* Sergent 1924 (E. S. R., 69, p. 866). It is pointed out that "tick fever", as understood in Australia, is associated with four different protozoan parasites. Of these, *Theileria mutans* Theiler 1906 seems to be almost, if not quite, harmless, while *Anaplasma marginale* Theiler 1910, *Piroplasma bigeminum* Smith and Kilborne 1893, and *Babesiella* sp. may each produce a serious disease of bovines.

Infection experiments indicated that animals previously infected by *B. argentinum* had developed no resistance to *P. bigeminum*, while "carriers" of *P. bigeminum* show considerable resistance to infection with *B. argentinum*. Compared with carriers of such parasites as *P. bigeminum*, *T. mutans*, and *A. marginale*, the tendency for carriers of *B. argentinum* to relapse is not so marked. Notwithstanding this fact, they do occasionally relapse with fatal results soon after splenectomy.

Piroblue (1 g), ichthargan (1 g), antimosan (100 cc), and todorit (10 cc) were found to have no effect on the bovine babesiasis. Trypaflavine (1 g) apparently is beneficial. *Boophilus microplus* Canestrini 1888, the common cattle tick, is apparently the natural transmitter of babesiasis in Australia.

A list is given of 23 references to the literature.

The occurrence of Brucella abortus in the blood of cows from infected herds [trans. title], A. Lübke (*Ztschr. Infektionskrank. u. Hyg. Haustiere*, *47* (*1935*), *No. 3, pp. 240–244; Eng. abs. in Bul. Hyg.*, *10* (*1935*), *No. 8, p. 513*).—In the first of 2 herds investigated 14 of 17 cows were found to be discharging *B. abortus* in their milk, of which 4 contained no demonstrable milk agglutinins. In 15 of the 17 cows *B. abortus* was demonstrated to be present in the circulating blood, 65.6 percent of the actual samples examined having proved positive. In the second herd, 30 of the 76 cows examined proved to be discharging *B. abortus* in their milk, 3 of which had no demonstrable milk agglutinins and 5 had no demonstrable blood serum agglutinins. In 4 of the 68 cows that were properly examined, *B. abortus* was present in the circulating blood.

The importance of bacterin treatment as a complementary to the stamping-out method in infectious abortion in cattle [trans. title], S. Wall (*Skand. Vet. Tidskr.*, *25* (*1935*), *No. 11, pp. 661–681; Eng. abs., pp. 678–681*).—The author's recommendations for the control of Bang's disease include the following measures: (1) Blood tests of all the cattle with the exception of the sucking calves; (2) strict isolation or, if possible, the slaughtering of all the animals reacting to [*Brucella*] *abortus* antigen; (3) bacterin treatment of all reaction-free animals; (4) investigation and effective cutting-off of all roads of infection which may be suspected of leading to the herd; (5) bacteriological examination of the drinking water given to the herd and effective measures for obtaining a supply which from a bacteriological point of view is pure and good; (6) cows that abort within 3 mo. after bacterin treatment should be slaughtered immediately; (7) blood tests of all the remaining animals in the herd should be made 3 mo. after bacterin treatment; (8) if, on the second examination, 3 mo. after bacterin treatment there be found any animal or animals showing the agglutination value 100, then these animals, and, if possible, those animals also which show the agglutination values 70, 50, 30, and 20 should be slaughtered, after which the other cattle (with the exception of the sucking calves) should be vaccinated with abortus vaccine. "If no animal is found with the agglutination value 100 when the second examination is made, then all the animals showing the agglutination values 70, 50, 30, and 20 should be slaughtered, after which the herd should be examined again 3 mo. afterward (6 mo. after the bacterin treatment). When this third examination is being made, 6 mo. after the bacterin treatment, all the reacting animals should, if possible, be extirpated from the herd."

Studies on bovine mastitis.—XI, Further observations on the control of chronic streptococcus mastitis, A. W. Stableforth, S. J. Edwards, and F. C. Minett (*Jour. Compar. Path. and Ther., 48 (1935), No. 4, pp. 300–315*).—In continuation of the authors' studies of bovine mastitis (E. S. R., 71, p. 534), an account is given of attempts made in six herds to control chronic mastitis due to *Streptococcus agalactiae*. The results obtained are considered to justify the following conclusions:

"Eradication of contagious streptococcus mastitis may be achieved under certain conditions by the simple expedient of segregating infected cows or, if that is not possible, by milking them last. The chances of success, however, are greatly increased if infected cows can be evacuated within a reasonable time. When this cannot be done, infusion of the infected udder with a suitable bactericidal agent should prove a useful aid. Whilst *S. agalactiae* in nearly all cases leads to permanent infection, it occasionally causes transient infections detectable only by the use of enrichment media. Experience has shown that the disease does not arise sporadically once all known sources of infection are removed. New infections must, therefore, be due to errors in milking or to deficiencies in methods of diagnosis. The formation where possible of a separate heifer herd is a measure of the greatest value."

Mastitis (garget) studies (*New York State Sta. Rpt. 1935, pp. 24–26*).—This report of studies of the year with mastitis of dairy cows (E. S. R., 72, p. 698) refers to tests for mastitis infection, a circular relating to which has been noted (E. S. R., 72, p. 105); its relation to sore throat epidemics; and the classification of the streptococci.

Further observations on bovine nasal schistosomiasis, M. A. N. Rao (*Indian Jour. Vet. Sci. and Anim. Husb., 5 (1935), No. 3, pp. 266–273, pls. 2, fig. 1*).—In this further contribution on nasal schistosomiasis (E. S. R., 71, p. 698) the author considers length-frequency curves of the ova of *Schistosoma nasalis* Rao and *S. spindalis* Montgomery to provide additional proof that these two worms are different. "No abnormal shapes of ova of *S. nasalis* could be detected in mature ova examined. The previous experiments of artificial infestation with cercariae indicae XXX Sewell 1922 to produce nasal schistosomiasis are confirmed. The buffalo and some bovines appear to have a partial immunity conferred by *S. spindalis* against a later infestation with *S. nasalis*. The presence of what looked like ova of *S. nasalis* in a growth from the base of horn of a bullock is recorded."

Johne's disease—a cattle menace, B. A. Beach, E. G. Hastings, and H. L. Mansfield (*Jersey Bul. and Dairy World, 55 (1936), No. 3, pp. 61, 62, 78, 79*).—A practical contribution on paratuberculosis.

Classification of the piroplasms of the bovine: The genus Piroplasma and its subgenus Babesiella [trans. title], E. Sergent, A. Donatien, and L. Parrot (*Jour. Compar. Path. and Ther., 48 (1935), No. 4, pp. 261–266, pl. 1, fig. 1*).—The authors deal with the differential characteristics of five species and their separation into two subgenera (*Piroplasma* sens. strict. and *Babesiella*), namely, *P. bigeminum*, *B. bovis*, *B. argentina*, *B. berbera*, and *B. major*. They revive the generic name *Piroplasma* of Patton 1895 for these Haemosporidia in preference to *Babesia* of Starcovici 1893 on the ground that *Babesia* was used by Trevisan in 1889 for a genus of bacteria.

Bovine piroplasmosis: A comparison of the results of treatment with trypaflavine and trypan blue, S. G. Wilson (*Vet. Rec., 16 (1936), No. 3, pp. 68–70*).—The treatment of 10 cases with trypaflavine and 7 with trypan blue is reported upon, the details being given in tables. Trypaflavine appeared to aggravate serious conditions, the smaller dose required having been the only advantage over trypan blue that it possessed.

Another piroplasmosis in Spain: False East Coast fever [trans. title], I. García (*Inst. Biol. Anim. [Spain], Trab., 2 (1934), pp. 107–120, figs. 2; abs. in Vet. Rec., 15 (1935), No. 18, p. 537*).—A report is made of a herd of 16 adult bovines attacked by *Theileria* (*Gonderia*) *mutans*.

The bacteriology of bovine streptococcus mastitis, F. C. Minett (*Jour. Hyg. [London], 35 (1935), No. 4, pp. 504–511*).—This is a critical review of the article by Gibson and Muir (E. S. R., 73, p. 541), presented with a list of 31 references to the literature.

Traumatic splenitis with postoperative pyemia, J. F. Bullard (*Jour. Amer. Vet. Med. Assoc., 88 (1936), No. 2, pp. 180–184, figs. 2*).—This report of a case of traumatic splenitis that occurred in a registered cow is contributed from the Indiana Experiment Station.

Diseases of young calves: A bacteriological examination of 100 cases, R. Lovell and D. L. Hughes (*Jour. Compar. Path. and Ther., 48 (1935), No. 4, pp. 267–284*).—In 69 of 100 calves dying within the first few months after birth it was found possible to isolate and identify the associated organism or organisms. Pure infections with *Bacterium coli* accounted for 37 cases, *Corynebacterium pyogenes* for 12, hemolytic coccobacilli for 6, *Salmonella typhimurium* for 2, and *Pasteurella* for 1. Mixed bacterial infections accounted for 11 cases, such organisms as *Staphylococcus aureus* and *Pseudomonas pyocyanea* being present in addition to certain of those encountered in pure infections. In the remaining 31 cases, the etiology was doubtful, indicated causes not considered bacterial, or was associated with bacteria which could not be identified with any known species.

Pyosepticaemia of calves, J. F. Shirlaw (*Indian Jour. Vet. Sci. and Anim. Husb., 5 (1935), No. 3, pp. 232–250, pls. 6, figs. 4*).—This is a discussion of calf pyosepticemia, particularly as regards its etiology and the factors which determine its incidence in herds. It includes an account of the symptomology, essential pathology, and histopathology of the disease, which is septicemic in young animals and pulmonary in older animals, the type of pneumonia being a special one. Bacteriological examination of a large number of cases shows that the disease in the Punjab is due to an organism of the *Streptococcus enteritidis* group, which was isolated from the lesions of the disease in the majority of cases. Experiments showed that it is impossible to transmit the disease by direct contact, nor could the disease be produced by feeding pure cultures, but the subcutaneous and intravenous inoculations of small amounts of cultures into indigenous calves showed the pathogenic nature of the organism isolated from naturally occurring cases.

Theileriasis of young calves in Baghdad dairies, C. MacHattie (*Indian Jour. Vet. Sci. and Anim. Husb., 5 (1935), No. 3, pp. 288–294, pl. 1*).—A disease of calves 2 to 3 weeks old which occurred in Baghdad was found to be due to *Theileria annulata*.

Atypical ovine babesiasis cured by gonacrine [trans. title], H. Lafenêtre and O. Verdier (*Rev. Vét. [Toulouse], 87 (1935), Nov., pp. 615–619*).—The authors' observations confirm those of Cuillé, Darraspen, and Chelle in 1930 (E. S. R., 63, p. 373) on an atypical ovine babesiasis characterized by a very high fever and respiratory complications, without icterus and hemoglobinuria. They also confirm the work of Velu and Zottner (E. S. R., 72, p. 694) on the remarkable efficacy of gonacrine in combating ovine babesiasis.

Foot-rot in sheep.—Preliminary note on aetiology and possibility of control, W. I. B. Beveridge (*Jour. Council Sci. and Indus. Res. [Aust.], 8 (1935), No. 4, pp. 308–315, figs. 3*).—It is reported that *Bacillus necrophorus*, considered by workers to be the specific cause of foot rot, failed in the author's hands to produce the disease, leading to the conclusion that it is not the primary causative organism. An organism which is described briefly has been found in great numbers in active lesions, and there is some evidence suggesting that it is the causal agent, although confirmation of this is lacking pending its isolation. This organism presents some difficulty in classification, but is probably an unusual type of spirochete.

A note on new dressings for fly-struck sheep, M. R. Freney and I. M. and M. J. Mackerras (*Jour. Council Sci. and Indus. Res. [Aust.], 8 (1935), No. 3, pp. 161–168, fig. 1*).—In experimental work the authors have found the glyceroboric dressings to give better results than any of the other preparations examined. The glyceroboric acid dressing is made by adding 3 lb. of powdered boric acid to 13 lb. (1 gal.) of glycerin. This resulting thick paste is heated and stirred until all the boric acid has dissolved, then cooled and stored. "The diboric preparation is probably the best, but is more difficult to prepare. It is made by dissolving gradually 4 lb. of powdered boric acid in 3 lb. of hot glycerin and heating the mixture to 300° F. Ten lb. of cold glycerin are then added, and the mixture is warmed and stirred until clear. It is then cooled and stored."

Modes of transmission of the virus of encephalomyelitis of equines in Argentina [trans. title], P. Remlinger and J. Bailly (*Compt. Rend. Soc. Biol. [Paris], 120 (1935), No. 38, pp. 983–985*).—Reference is made to a case in which the transmission of encephalomyelitis took place through the closely shaved skin of a guinea pig that was exposed to an emulsion from the brain of a rabbit dead of the disease. The experimental transmission of encephalomyelitis to an adult donkey through drinking water containing emulsions of the brains and organs of animals dead of the disease is also reported upon.

Canine babesiasis in the United States, G. Dikmans (*North Amer. Vet., 16 (1935), No. 1, pp. 45–48, fig. 1*).—The reported finding of *Babesia canis* in the blood of dogs in Jacksonville, Fla., has led the author to a discussion of the species causing canine babesiasis, its transmission, and its treatment.

The occurrence of infectious laryngo-tracheitis in fowls in New South Wales, H. R. Seddon and L. Hart (*Aust. Vet. Jour., 11 (1935), No. 6, pp. 212–223, pls. 2*).—An account is given of infectious laryngotracheitis, some 12 outbreaks of which were recorded in New South Wales in 1935. Although these were the first outbreaks to have been recognized, there is said to be every reason for the belief that the disease had been enzootic in New South Wales for several years.

Fowl cholera (hemorrhagic septicemia of fowls), R. GRAHAM (*Illinois Sta. Circ. 441 (1935), pp. 8, figs. 5*).—A brief account is given of the cause, symptoms, lesions, and preventive measures for fowl cholera.

Fowl leukemia and paralysis, M. W. EMMEL (*U. S. Egg and Poultry Mag., 42 (1936), No. 2, pp. 83, 126, 127*).—This practical contribution from the Florida Experiment Station is based upon work previously noted (E. S. R., 74, p. 262).

Fowl paralysis: An analysis of one thousand cases, J. C. THOMAS and H. P. HAMILTON (*Vet. Jour., 91 (1935), No. 12, pp. 526–536, figs. 4*).—This is a report of a statistical investigation undertaken with a view to establishing certain points in the gross morbid anatomy and pathogenesis of fowl paralysis.

Studies on incubator hygiene.—IV, A note on the virucidal effect of formaldehyde on fowl pox virus, R. GRAHAM and E. H. BARGER (*Poultry Sci., 15 (1936), No. 1, pp. 48–52, figs. 2*).—In this continuation of the studies previously noted (E. S. R., 70, p. 835), fowl pox virus in a 1-percent aqueous suspension on cotton squares, on the feet and the down of day-old chicks, upon being subjected to routine incubator fumigation (formaldehyde released from cheesecloth in amounts of 20 cc per 100 cu. ft.), was found to survive 30 min., often 45 and 50 min., but was consistently noninfective after 90 min. The infectivity of fowl pox virus 1-percent aqueous suspension on cotton squares fumigated for 30 and 45 min. was not appreciably altered, as judged by lesions induced following inoculation of the scarified combs and of the feather follicles of the chicks as well as by the infectiousness of the disease as demonstrated by its development in susceptible chicks by pen exposure.

"No evidence was obtained to suggest that fowl pox virus rendered noninfective by formaldehyde fumigation retained antigenic properties. The inert virus upon being applied to chicks, with few exceptions, failed to provide a measurable degree of protection against artificial exposure to fowl pox. The virucidal properties of formaldehyde in amounts recommended in incubator fumigations for the suppression of incubator-disseminated pullorum disease proved valuable in the destruction of fowl pox virus."

The occurrence of Bacillus pullorum septicaemia in adult hens in Western Australia, H. W. BENNETTS (*Aust. Vet. Jour., 11 (1935), No. 6, pp. 223–227*).—The appearance of pullorum disease in Western Australia is recorded for the first time. In the outbreak described, the mortality was confined to birds from 10 to 12 mo. old, some 300 to 400 out of 1,500 having succumbed to a septicemic infection over a period of 2 mo.

Thrush in fowls [trans. title], U. PLAZIKOWSKI (*Skand. Vet. Tidskr., 25 (1935), No. 11, pp. 682–697, figs. 3; Eng. abs., pp. 696, 697*).—A description is given of thrush as observed on six poultry farms.

It is recommended that when the disease makes its appearance all the poultry houses be thoroughly cleaned and then disinfected by a 1-percent solution of chloramine or an equivalent disinfectant. All perfectly healthy birds should be taken from the affected house and kept isolated in a clean, preferably new, building. A change of feed should be made both for the sick and the healthy birds, and in addition medicinal treatment should be given in the form of a disinfectant dissolved in the drinking water. To prevent an outbreak of the disease in chickens, the author recommends the addition of a 0.2-percent chloramine solution to the drinking water.

Factors in the resistance of chickens to the nematode Ascaridia lineata (Schneider), J. E. Ackert (*Trudy Din. Razv.* [*Moskva*] (*Trans. Dyn. Devlpmt.*), *10* (*1935*), *pp. 413–422; Russ. abs., p. 422*).—Contributing from the Kansas Experiment Station, reports are given on several series of experiments involving 3,000 growing chickens on which studies were made to determine the factors in chicken resistance to the intestinal nematode *A. lineata*. "The chickens were raised in confinement, helminth-free, until parasitized with embryonated eggs of the nematode. The criteria for determining the degree of resistance were the numbers (viability) and the lengths (growth) of the *A. lineata* from the various groups of chickens under comparison. Factors in the resistance of chickens to this nematode include full complement of blood, age of the fowl, adequate supply of vitamin A and vitamin B (complex), and a suitable range of amino acids as supplied in a cereal ration supplemented by animal tissues and milk."

"It is concluded that vitamin D is not a factor in the resistance of chickens to this nematode, but its supply and the inclusion of milk in the diet aid in protecting the chicken against detrimental effects of the parasite. One or more previous infestations of *A. lineata* may increase the resistance of the chicken to this nematode. Some breeds of chickens appear to be more resistant to the growth of *A. lineata* than are other breeds. The most resistant breeds as tested were the Rhode Island Reds, the Barred and the White Plymouth Rocks, and the White Minorcas; the least resistant, the White Leghorns and Buff Orpingtons. There are indications of markedly resistant strains within a breed.

"The food of the nematode is discussed. *A. lineata* does not appear to be able to feed and live in the body cavity of the chicken. It does not require vitamins A, B, or D. While the nature of the resistance is unknown, its potency is probably due to many factors."

A list of 47 references to the literature is included.

Efficiency of vermifuges for poultry, W. L. Bleecker (*Arkansas Sta. Bul. 323* (*1935*), *pp. 32, 33*).—The work of the year is briefly noted (E. S. R., 72, p. 845).

Salmonella infections of the duckling and chicken [trans. title], J. Jansen (*Tijdschr. Diergeneesk.*, *63* (*1936*), *No. 3*, *pp. 140–142; Ger., Eng., Fr. abs., p. 142*).—A mortality among ducklings due to *S. enteritidis* var. *essen* and *S. typhimurium* and a spontaneous case of mortality in a chicken due to *S. enteritidis* var. *essen* are reported upon.

Observations on pendulous crop in turkeys, W. R. Hinshaw and V. S. Asmundson (*Jour. Amer. Vet. Med. Assoc.*, *88* (*1936*), *No. 2*, *pp. 154–165, figs. 2*).—This is a report of observations in California made principally on one flock where the yearly incidence was 5.52 percent in 1932, 3.88 percent in 1933, and 10.44 percent in 1934.

"In a group of 206 pendulous-crop turkeys kept under observation until maturity or death, 73 (35.44 percent) recovered and remained normal. Of those that did not recover, 72 (34.95 percent) died as a direct result of the condition, 7 (3.39 percent) died from miscellaneous causes, and 44 (21.36 percent) were killed because of emaciation. The remaining 10 (4.85 percent) were killed at maturity as fit for market but were of poor quality. The common causes of death were ruptured crops caused by self-incurred lacerations, injury by pen mates, and mechanical pneumonia. The chief autopsy findings in advanced cases were distention with liquid or semiliquid contents of a sour, acrid, or fetid odor, a thickening of the mucous membrane with varying degrees of ulceration, and, in a small percentage, caseation of all or portions of the lungs and air sacs with definite evidence of foreign material in the bronchi.

"Several factors appear to influence the incidence in a flock. Heredity is probably the most important of these, but the indications are that birds having the same genetic constitution may or may not develop the abnormality, depending on certain environmental conditions. Most of the cases that have been observed have appeared when the poults were between 9 and 12 weeks of age, and have been associated with excessive liquid consumption during heat waves that were accompanied by extremely low humidity.

"Methods of control and treatment have included daily draining of the crops, washing the crops with weak antiseptics at daily intervals, portioning of drinking water after drainage, and various operative procedures, but they have not greatly influenced the number of recoveries. Removal of most of the bulbous portion of the crop has proved a successful means of correcting the condition in birds that are to be kept for experimental breeding purposes, but the mortality following such procedure has approximated 50 percent. Selection of resistant breeding stock appears to be the logical means of prevention."

Studies on Trichomonas columbae, a flagellate parasitic in pigeons and doves, G. Cauthen (*Amer. Jour. Hyg., 23 (1936), No. 1, pp. 132–142*).—In studying the mortality associated with *T. columbae* infection in a colony of domestic pigeons, ringdoves, and mourning doves, all three were found to be infected with this parasite. The mortality associated with *T. columbae* lesions varied from 2 to 33.3 percent in the different groups of birds, averaging 7.2 percent. The order of progressive susceptibility was common pigeons, ringdoves, and mourning doves. Trichomonad lesions occurred more frequently in juvenile than in adult birds. Previously published reports of the pathogenicity of *T. columbae* were confirmed. The organism, free from bacteria, introduced into liver, muscle, or subcutaneous tissue was capable of maintaining itself and of causing tissue injury.

"Chickens on a mash diet did not become infected with *T. columbae.* After being fed on ringdove ration, however, they harbored the organism for various but relatively extended periods of time. It was concluded that under natural conditions, chickens do not constitute a reservoir of infection for pigeons."

Susceptibility of the bird to Erysipelothrix rhusiopathiae [trans. title], G. C. de la Villa (*Inst. Biol. Anim.* [*Spain*], *Trab., 2 (1934), pp. 330, 331; abs. in Vet. Rec., 15 (1935), No. 30, p. 863*).—The author has found by intramuscular inoculations that the flicker or yellowhammer is extremely susceptible to the causative organism of swine erysipelas and to yield typical lesions.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations by the Arkansas Station], D. G. Carter, J. B. Woods, R. M. Smith, R. P. Bartholomew, and L. C. Kapp (*Arkansas Sta. Bul. 323 (1935), pp. 7, 8*).—The progress results are presented of investigations on durability of posts and methods of preservative treatment, and the influence of poultry housing factors on egg production.

[Agricultural engineering investigations by the Cornell Station] (*[New York] Cornell Sta. Rpt. 1935, pp. 65, 66, 72*).—The progress results are briefly presented of investigations on milk-cooling equipment by H. W. Riley and B. A. Jennings, and milk-house construction and equipment by Jennings, Riley, M. W. Nixon, and H. J. Brueckner.

Floods in the United States: Magnitude and frequency, C. S. Jarvis et al. (*U. S. Geol. Survey, Water-Supply Paper 771 (1936), pp. 497, pls. 3,* *figs. 22*).—This report, prepared in collaboration with the Water Planning Committee of the National Resources Board and its predecessor the Mississippi Valley Committee, presents much of the basic information on floods now available for certain rivers in the United States. For some rivers the characteristics relating to stages and flows of floods are compiled and analyzed for the first time. "The objective has been to review the technic and procedure of estimating expected floods and to compile, in a form suited for ready reference, flood statistics for streams where long-time records are available. The results of the study here presented are a substantial contribution to this end."

Curbing the wind, L. C. AICHER (*Kans. State Bd. Agr. Bien. Rpt.*, *29* (*1933–34*), *pp. 67–71*).—High winds during the recent period of dust storms, the Kansas Experiment Station says, "removed the top soil as far down as it was plowed from a large number of farms in the Great Plains area" and rendered the land unfit for farming. Restoration is a slow process, but the station has tested and recommends certain procedures and farm practices which appear to give satisfactory results in curbing the damage. These include roughing or ridging and listing of the soil, refraining from burning off wheat stubble, avoiding clean culture, increasing the organic matter of the soil as far as possible, and using the duckfoot cultivator or similar tools in preparing wheat stubble for fall seeding. Intelligent community action is considered essential for prevention of soil blowing.

The infiltration capacity of soils in relation to the control of surface runoff and erosion, G. W. MUSGRAVE (*Amer. Soil Survey Assoc. Bul. 16* (*1935*), *p. 127*).—In a brief note from the U. S. D. A. Iowa and Missouri Soil Erosion Experiment Stations, the author emphasizes the great importance of the infiltration capacity of a soil which "on many soils . . . has a greater effect upon run-off than any other factor." As an example of the wide differences which may be met with: "The infiltration rate of the Marshall silt loam was found to be nearly 10 times greater than that of the Shelby." The inches of rainfall which can be taken care of, per hour, by an impoundment of 1.5 in. of water on each of these two soils are shown for 1, 2, 3, and 4 hr. An impoundment of 1.5 in. of water would protect the Marshall silt loam during a rainfall up to 4.75 in. in 4 hr., whereas the Shelby silt loam, with the benefit of the same impoundment, could receive only 1.9 in. of rainfall in the same period without run-off.

"It is therefore obviously erroneous to attempt to apply like measures for the control of surface run-off and erosion to both permeable and impermeable soils. The amount of erosion occurring from a field for a rain of given intensity and duration may be approximately predetermined for a given set of conditions if quantitative data are available for (1) the rate of infiltration for the soil and conditions, (2) the amount of water impounded upon the surface of the field by the treatment, and (3) the density of run-off in pounds of soil per cubic foot of run-off for the soil and treatment."

Relation of soil conservation to land utilization in the Red Plains area of Oklahoma, N. E. WINTERS (*Amer. Soil Survey Assoc. Bul. 16* (*1935*), *pp. 131–135*, *figs. 5*).—From examples and general considerations given in a contribution from the Soil Erosion Service, U. S. Department of the Interior, the author concludes that "farming on the contour will control the moisture from gentle rains and keep it distributed over the field where it is most available for crop production, but in the case of a heavy deluge, when the contour rows break over, terraces are needed as a means of safety in the prevention of gully formation. Even then small rivulets are formed in the intervals, and there is a gradual soil movement down the slope between the terraces. This soil movement can be held in check only by good cropping methods, using erosion-resistant cover crops in rotation with clean cultivated crops all planted on the contour."

Recent results of engineering experiments in soil and water conservation at the soil erosion experiment station, Tyler, Texas, R. W. Baird (*6. Southwest Soil and Water Conserv. Conf., Tyler, Tex., 1935, Proc., pp. 16–20*).—Data on run-off and soil losses from field areas with different characteristics and from different types of terraces, on erosion control in terrace outlet ditches and gullies, and on the use of farm machinery on terraced land are summarized.

For three terraces 1,700 ft. long, with a uniform grade of 3″ per 100′ and with vertical spacings of 5, 4, and 3 ft., the soil losses have been 6.95, 6.46, and 4.20 tons per acre per year, respectively, for a 4-yr. period. Short terraces (700 ft.) with spacings of 3, 4, and 6 ft. show similar results, the soil losses for a 2.5-yr. period being 5.38, 6.54, and 7.24 tons per acre per year, respectively. Results for 4 yr. have definitely shown that there are excessive soil losses from terraces with grades of 6″ per 100′.

For long terraces (1,700 ft.), a terrace with a variable grade of 0″–3″ per 100′ has had a soil loss of 6 tons per acre per year, while a similar terrace with a uniform grade of 3″ per 100′ has had a soil loss of 6.95 tons per acre per year. The terrace with the uniform grade has also had the greater amount of run-off. Very long terraces with grades of 3″ per 100′ do not seem to be desirable. For 4 yr. a terrace 1,700 ft. long has had 1.19 times as much soil loss as a similar terrace 700 ft. long. However, the average run-off from the short terrace has been 10.22 in. per year and 7.95 in. per year from the long terrace. The run-off from this short terrace is consistently high, probably due to local field conditions, but from results for other graded terraces there is appreciably greater run-off from the short terraces.

There is a very marked difference in the maximum rate of run-off that may be expected from different areas and from different types of terraces. The most striking difference is between woodland and an unterraced, gullied, cultivated area which is quite similar. For a 3.5-yr. period the maximum rate of run-off from the wooded area has been only 0.31 in. per hour, while from the cultivated area a maximum rate of 4.46 in. per hour was obtained for one rain.

The effect of different types of terraces on the maximum rate of run-off is more consistent than on either the total run-off or on the amount of soil loss. The effect of the length of terraces is also quite marked, the maximum rate of run-off decreasing as the length increases.

A summary of the recent results of engineering experiments in soil and water conservation at the Blackland Soil Erosion Experiment Station, Temple, Texas, P. L. Hopkins (*6. Southwest Soil and Water Conserv. Conf., Tyler, Tex., 1935, Proc., pp. 24–27*).—Data on erosion control as influenced by terrace design, construction, and maintenance are summarized. They show that soil losses increase with an increase of vertical interval on cultivated land, but that other factors are also important. It is apparent that a vertical interval of 3 ft. is best for slopes of from 3 to 5 percent on the black land.

Public Roads, [January 1936] (*U. S. Dept. Agr., Public Roads, 16 (1936), No. 11, pp. 225–248+[1], figs. 16*).—This number of this periodical contains the current status of Federal-aid highway projects and U. S. Public Works program highway and grade-crossing projects, all as of December 31, 1935, and the following articles: Digest of Report on Connecticut Traffic Survey, by L. E. Peabody (pp. 225–237, 244); Some Characteristics of Highway Traffic in

Rhode Island (pp. 238, 239, 243, 244); Automatic Pumping Units for Underpasses, by M. Deuterman (pp. 240–243); and Complete Canvass of Motor-Vehicle Transportation to be Made, by R. L. Dewey (p. 245).

Comparative cost of operation of a Fordson tractor using kerosene and alcohol as motor fuels, A. B. Catambay and N. L. Cuevas (*Philippine Agr., 24 (1935), No. 7, pp. 549–561, fig. 1*).—Studies are reported on engine performance, cost of field operations, and oil and fuel consumption of a tractor using kerosene and alcohol fuels. The field operations consisted of plowing with a 2-furrow, 24-in. disk plow.

It required 1.15 times as much alcohol as kerosene by volume to plow the same area, and there was a saving of 0.63 hr. per hectare (2.471 acres) when using kerosene for fuel as compared with alcohol. The cost of field operation was cheaper with alcohol than with kerosene.

It was found that to operate the tractor with alcohol at the same fuel cost as with kerosene, the price of alcohol should be 0.87 times the price of kerosene, the prevailing price being 0.66 times. The tractor cannot be started with kerosene but can with alcohol, though the engine starts more readily on alcohol in hot weather than in cold. At the heavier loads alcohol fuel gave a better performance than kerosene fuel.

American lubricating greases, J. I. Clower (*Va. Engin. Expt. Sta. Bul. 35 (1935), pp. 80, figs. 25*).—The purpose of this bulletin is to aid buyers and users in making a more understanding selection of greases for their needs. The point of view of the user has been emphasized throughout rather than that of the manufacturer. Information concerning composition, manufacture, uses, and testing is given in brief, nontechnical wording. Sections are included on manufacture of greases; tests and their significance, including physical, mechanical, and chemical tests; grease v. oil lubrication; methods of application; and specifications.

Engineering phases of the REA program, W. E. Herring (*Agr. Engin., 17 (1936), No. 2, pp. 63, 64*).—A brief description is given of the activities of the Rural Electrification Administration, with emphasis on some of its engineering features.

A nomographic chart for the Iowa dynamometer, J. Roberts (*Agr. Engin., 17 (1936), No. 2, pp. 68, 69, figs. 3*).—In a contribution from Kansas State College, a chart is presented by means of which it is possible to convert dynamometer readings into pounds pull and time in seconds into miles per hour, or miles per hour into time in seconds. Both the pounds pull and the time in seconds can be converted into their horsepower value.

Terracing machinery and terrace construction practices (*Agr. Engin., 17 (1936), No. 2, pp. 47–54, figs. 6*).—This is a symposium including papers relating to the subject, as follows: In the Southwest Area, by R. W. Baird; In the Corn Belt Area, by V. D. Young; In the Great Plains Area, by R. R. Drake; In the Pacific Northwest Area, by P. C. McGrew; Factors Affecting Terracing Costs, by G. F. Hoover; Problems in Determining Terracing Costs, by W. A. Clegg; and Types of Machines and Selling Policies, by J. W. Carpenter, Jr.

The size of terracing equipment, N. W. Wilson and M. L. Nichols (*Agr. Engin., 17 (1936), No. 2, pp. 55–62, figs. 8*).—Tests conducted cooperatively by the Alabama Experiment Station, the U. S. D. A. Soil Conservation Service, and manufacturers of equipment are reported, the purpose of which was to determine the most economical size of power terracing equipment.

The tests were made on rather typical Piedmont farms. The general topography was rolling, with grades averaging from 7 to 12 percent. The fields were in old bench terraces ranging in height from 1 to 6 ft., the bench terraces containing large rocks and frequently stumps and saplings. The soil was Cecil clay, mainly B and C horizons, most of the surface having been washed away, and in general the conditions were as severe as one would expect to encounter in practical terracing. The terraces constructed were of the broad-base ditch type. The smaller of the two units tested consisted of a 48-hp. track-laying tractor designed to burn fuel oil, similar to that used in Diesel tractors, by solid injection. The larger outfit was of the identical type, but had a 76-hp. rating. The smaller was of the hillside or wide-tread type, and the larger was a standard tread. The terracers, while of the same general type of construction, differed in that the larger outfit had a 12-ft. blade which was power controlled and operated, the power being supplied by an auxiliary gasoline engine mounted on its frame. The small terracer was a standard, hand-operated model, equipped with a 10-ft. blade.

It is concluded from these experiments that where large areas are to be terraced the large outfit, even at twice the initial cost, would be at least equally as efficient as the small unit. It would, moreover, have the advantage of requiring one-half the labor, which would thus bring down the cost per acre, as well as that of being able to move larger rocks and stumps. The larger blade appeared to handle the soil as efficiently as the smaller blades, and the amount of soil moved appeared to be in proportion to the power rather than the length of the blade. There was no appreciable difference in turning at the ends.

Progress in the study of the mechanical harvesting of cotton, H. P. Smith, D. T. Killough, D. L. Jones, and M. H. Byrom (*Texas Sta. Bul. 511 (1935), pp. 35, figs. 13*).—This bulletin reports the results obtained in the study of the mechanical harvesting of cotton and describes improvements made on the Texas Station cotton harvester during the period 1932–34 to increase its efficiency (E. S. R., 68, p. 105). A complete description is also given of the construction of an experimental roll-type sled harvester, of a bur extractor, and of a cylinder cleaner.

Tests made in 1932 with the roll-type stripper sled to determine what effect the angle of the rolls, the size of the rolls, and the speed at which they revolve would have on the efficiency of stripping rolls constructed of wood and steel indicated that (1) stripping rolls made from steel or wood having a slightly roughened surface gave a high efficiency when used to harvest cotton, (2) stripping rolls 2$\frac{7}{16}$ in. in diameter were more efficient than rolls 3 in. in diameter, (3) the most efficient angle for operating stripping rolls 56 in. in length was between 25° and 30° with the ground, and (4) a higher percentage of the cotton was harvested when the roll travel was faster than the tractor travel.

When stripping rolls made of wood, steel, and rubber were used in the Texas Station harvester at three roll speeds and set at an angle of approximately 28°, the highest percentage of the cotton was harvested with the highest roll speed. Similar results were secured when rubber rolls and knurled surfaced steel rolls were compared at different speeds. The rubber rolls operated at high roll speed harvested 96.8 percent with Ducona cotton and 95.5 percent with Lone Star cotton, while the knurled surface steel rolls harvested 96.2 percent with Ducona and 97.0 percent with Lone Star.

Rubber stripping rolls harvested a higher percentage of cotton than wood or steel stripping rolls. There was no significant difference in the efficiency of rubber rolls and knurled surfaced steel rolls.

When the effects of tractor speeds were compared, the average percentage of the cotton harvested was 96.0, 95.5, and 94.7 percent for low, second, and high tractor gear speeds, respectively. The feet travel of the roll surface per foot of tractor travel was 1.02 ft. for low, 0.68 ft. for second, and 0.50 ft. for high tractor gear speeds.

The relation of roll travel to tractor travel was found to be an influencing factor on the efficiency of stripping rolls, since there was an average increase of approximately 23 percent in roll travel per foot of tractor travel of medium roll speed over low roll speed, an increase of approximately 13 percent of high over medium roll speed, and an increase of approximately 33 percent of high over low roll speed. In 9 of 15 comparisons the low roll speed harvested a higher percentage of the cotton than the medium roll speed, in 12 of 15 comparisons the high roll speed was more efficient than the medium roll speed, and in 14 of 15 comparisons the high roll speed was more efficient than the low roll speed.

Cleaned on the Texas Station bur extractor and on the Texas Station cylinder cleaner in 1934, mechanically harvested cotton showed a removal of burs, unopen green bolls, dirt, and trash, including leaves and stems, amounting to approximately 50 percent of the weight of the harvested cotton from the Ducona variety and 51 percent from the Lone Star variety. Ducona cotton so cleaned classed two grades higher than Ducona cotton extracted and cleaned the same year with available commercial bur extracting and cleaning equipment.

The efficiency of the Texas Station cotton harvester was greatly influenced by the varietal characteristics of the different varieties harvested. In tests with a number of varieties of cotton in 1932, 1933, and 1934, the highest efficiency, 96.6 to 99.0 percent, was obtained in harvesting varieties in which the plants had short fruiting branches, short vegetative branches, and storm-resistant bolls.

An average of 16.5 percent of the green leaves was removed from the plants in full foliage at the time of harvesting the cotton in September. The leaves in the cotton contained an average of 71.6 percent moisture. There was 60.8 percent moisture in the unopen mature green bolls and 71.7 percent moisture in the unopen immature green bolls that were collected with the green leaves in harvesting the cotton.

New developments in mechanical equipment to control insect pests and plant diseases, R. M. Merrill (*Agr. Engin., 17 (1936), No. 1, pp. 13, 16, figs. 3*).—In a contribution from the U. S. D. A. Bureau of Agricultural Engineering, brief descriptions are given of some of the more recent developments in mechanical methods of pest control. These include burning, plowing, and vapor spraying.

Rate of wear of spray-gun disks, O. C. French (*Agr. Engin., 17 (1936), No. 2, pp. 67, 88, fig. 1*).—Tests conducted at the California Experiment Station to determine the rate of wear of six different kinds of spray disks by forcing bordeaux spray solution through them at a pressure of 450 lb. per square inch are reported.

The results indicated that the sheet brass disk was the only one that showed very rapid wear with bordeaux mixture. A large part of the wear of each disk occurred during the first few hours, which probably resulted because the rough edges left by the drill were rapidly worn away. After running the tests for as long as 39.5 hr. the difference in discharge of the standard Bean disk and the harder disks was not as great as might be expected. The conclusion was that probably much of the wear of disks is caused by water which has fine abrasive material in it rather than abrasion by the spray mixture. When an arbitrary amount of 0.25 percent of sand that passed a 48-

mesh screen was mixed with clear water and run through three disks, more wear occurred in 1 hr. than during 39.5 hr. when using bordeaux. This is probably an explanation of why some spray operators have to change disks more often than others. The Stellite disk offered considerably greater resistance to wear than the other disks.

It appears that even a hard disk, such as Stellite, cannot satisfactorily resist abrasion from sandy water, but the hardened stainless steel and the Stellite disks have the advantage of being rust-proof, besides being more resistant to wear. Unless ordinary disks are kept oiled when not in use, rust will form around the orifices and soon ruin them.

The use of water free of fine sand will greatly lengthen the life of spray disks. It is suggested that when elevated water storage tanks are used to fill the spray tanks they also be used as sediment-collecting tanks. Instead of taking the water out near the bottom of the elevated tank, as is ordinarily done, if it is taken out about 12 in. from the bottom, most of the sand or fine grit will have settled to the bottom and will not find its way into the spray tank.

An absorptive agent for drying grain, W. M. Hurst and W. R. Humphries (*Agr. Engin., 17 (1936), No. 2, p. 62*).—In a brief contribution from the U. S. D. A. Bureau of Agricultural Engineering, the results of a series of tests on the use of an inert silica absorptive agent for drying wheat, soybeans, flax, corn, and rice are reported.

The data show that the moisture content of the samples of grain, soybeans, and flaxseed was reduced from 20 to 14 percent or lower in from 24 to 48 hr. The samples in which the grain was left in contact with the drier for more than 48 hr. showed, in most cases, a further reduction in moisture. The drier used apparently absorbed more than 25 percent of its weight of water in reducing the moisture content of grain from 20 to 14 percent. It is estimated that with a 33⅓ percent absorption approximately 12.5 lb. of the product would be required to dry 1 bu. (60 lb.) of wheat. In few cases, however, would grain have a moisture content as high as 20 percent when threshed. In case it had 18 percent moisture and the drier would absorb 33⅓ percent of its weight of water, approximately 7.5 lb. would be required per bushel of wheat to reduce the moisture content to 14 percent.

Oxidation and gas formation in the spontaneous heating of hay, E. J. Hoffman (*Jour. Agr. Res. [U. S.], 51 (1935), No. 6, pp. 527–546, figs. 3*).—In a series of large-scale experiments on the spontaneous heating of alfalfa hay, conducted by the U. S. D. A. Bureau of Chemistry and Soils, hay was stored under varying conditions in order to determine those conducive to excessive heating and ultimately to spontaneous ignition, as well as to investigate the causes and effects of spontaneous heating under these conditions. The results of analyses of the gases formed during the heating of hay in these experiments showed a striking similarity to the results of a laboratory study designed to determine the relative tendency of undecomposed and decomposed hay to absorb oxygen. For this reason both investigations are presented in this paper.

The results indicate that along with the operation of biological agencies in the heating haymow there occurs a purely chemical oxidation, evidenced by a loss of oxygen considerably in excess of the carbon dioxide formed. This chemical oxidation is more marked beyond the temperature range usually ascribed to the activity of micro-organisms.

Explosibility of agricultural and other dusts as indicated by maximum pressure and rates of pressure rise, P. W. Edwards and L. R. Leinbach (*U. S. Dept. Agr., Tech. Bul. 490 (1935), pp. 24, figs. 2*).—An apparatus and method are described for the determination of the explosibility of dusts. In addition to the maximum pressure developed on explosion, average rate and maximum rate of pressure rise are taken as criteria of explosibility. The explosibility of 133 dusts was determined at two concentrations, 100 and 500 mg of dust per liter of air.

To compare the explosibility of dusts, three important factors that enter into an explosive reaction should be taken into consideration, namely, the maximum pressure developed on explosion, the average rate of pressure rise, and the maximum rate of pressure rise.

A study of the structural damage caused by dust explosions has shown that the rate of pressure rise, which may be called the dynamic load, is responsible to a large extent for the damage done. If the rate of rise is sufficiently low, the load on the structure may be released by the blowing out of windows without causing further damage. If the rate of rise is high enough and if the pressure cannot be released sufficiently by windows or other vents, structural damage will occur. For these reasons, the rates of pressure rise, in addition to the maximum pressure, are given as criteria of explosibility.

The ratio of 500-mg value to 100 mg value shows the desirability of making explosibility tests at more than one concentration of dust in air. In some cases the values for maximum pressure and average rate or maximum rate of pressure rise at a concentration of 500 mg per liter are about half the values obtained at the 100-mg-per-liter concentration, while with another dust the pressure developed with a 500-mg-per-liter concentration is 7.5 times that developed at 100 mg per liter. Since the tests reported were made at both concentrations, it is believed that they have more significance than those made at one concentration.

Roof coverings for farm buildings and their repair, A. D. EDGAR and T. A. H. MILLER (*U. S. Dept. Agr., Farmers' Bul. 1751 (1935), pp. II+30, figs. 26*).—This describes the common types of roof coverings, classified as rigid shingles, bituminous roofing, metal roofing, and canvas roofing, and details the essential steps to be taken in making repairs. Information regarding certain roofing details is also given, including such items as nails, flashing, gutters, downspouts, and snow guards.

A low-cost floor of reinforced tile, H. GIESE and C. T. BRIDGMAN (*Agr. Engin., 17 (1936), No. 1, pp. 14–16, figs. 6*).—Studies conducted at the Iowa Experiment Station on a new type of floor construction using a combination of clay tile, concrete, and steel are reported. This floor consists essentially of precast tile beams or joists with floor tile fillers or span tile extending from one beam to the next. Bending and shear tests of beams showed that the section possesses ample stiffness, and that failure does not occur until material deformation has occurred.

Data are given on load at failure and deflection at design load, together with calculated stresses at maximum load and design data for various conditions of span length and floor loading.

An improved non-metallic sheathed wiring installation for rural buildings, V. M. MURRAY and L. C. LARSON (*Agr. Engin., 17 (1936), No. 1, pp. 23–27, figs. 16*).—Studies conducted by the College of Engineering of the University of Wisconsin are reported which showed that the essential requirements of a good wiring system for rural buildings, particularly barns housing livestock, are (1) the conductors must have adequate protection against mechanical injury, (2) the shock hazard to persons and livestock should be eliminated, (3) the purchaser of the system should receive a lasting or long-life installation—a system which will resist the corrosive elements present in barns, (4) the initial and annual costs should compete with other permanent wiring systems, and (5) the fire hazard should be reduced to a minimum consistent with the above four requirements.

To meet these requirements a completely nonmetallic sheathed installation is described. In this installation the conductors are protected in a sheathed cable, which in turn is adequately protected by wood stripping or by the studding of the building everywhere below the 7-ft. level. Nonconducting cable sheathing and porcelain outlet boxes, together with porcelain or bakelite lamp sockets and box covers, were found to afford little, if any, likelihood of electric shock to either man or animal.

Cost studies made of an actual installation demonstrated that the nonmetallic sheathed installation can be provided, at present, at a cost comparable to the cost of a BX system. The probable small increased cost over that for an open knob-and-tube installation can be justified by the extra protection afforded the conductors and the resultant compact, neat arrangement of cable and outlet boxes.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics by the Arkansas Station 1934–35] (*Arkansas Sta. Bul. 323 (1935), pp. 49, 50*).—Results of investigations not previously noted are reported as follows: (1) Findings as to tax delinquency indebtedness, etc., in drainage and levee districts, by C. O. Brannen; (2) findings as to the relation of net cash receipts and taxes for selected farms 1929–34, by Brannen, in a study made in cooperation with the Bureau of Agricultural Economics, U. S. D. A.; and (3) data as to State-owned lands, by O. J. Hall.

[Investigations in agricultural economics by the Cornell Station] (*[New York] Cornell Sta. Rpt. 1935, pp. 60–65*).—Included are (1) some preliminary findings of costs of sales in the Harlem Farmers Market and through commission firms on the Washington Wholesale Market in Manhattan, New York City, costs of operating 1½ ton trucks and of labor, types of purchasers, etc., in an economic study of the use of the motor truck in marketing fruit and vegetables in the area economically tributary to the New York metropolitan market, by M. P. Rasmussen et al., and (2) findings as to percentages of potatoes marketed with motor trucks in 5 western New York counties in 1932 in a study of the marketing of potatoes by motor truck in western New York, by P. J. Findlen and Rasmussen.

[Investigations in agricultural economics at the Ohio Station] (*Ohio Sta. Bimo. Bul. 178 (1936), pp. 25–27, fig. 1*).—The index numbers of production, prices, and income, by J. I. Falconer (E. S. R., 74, p. —), are brought down through October 1935. An article by F. L. Morison on What Are The Possibilities of Increased Crop Acreage is included.

Proceedings of the sixth annual meeting of the Canadian Society of Agricultural Economics, Macdonald College, Quebec, 1934 (*[Ottawa], 1934, pp. [2]+121*).—Included are the following papers presented at the meeting held at Macdonald College, Province of Quebec, June 25 to 28, 1934: Some Problems in Farm Taxation in Ontario, by S. C. Hudson, and discussion by J. E. Lattimer; The Organization of an Agricultural Outlook Service for Canada, by J. F. Booth; The Use of Outlook Information in Planning a Farm Programme, by W. V. Longley; Research in Agricultural Economics and Farm Management, by A. Gosselin; The Canadian Census of Agriculture, by O. A. Lemieux; The Background of Present Legislation to Regulate Marketing, by

J. F. Booth; The Natural Products Marketing Act, 1934, by G. H. S. Barton; Marketing of Australian Farm Products Through Federal and State Boards, by L. R. MacGregor; An Appraisal of the Programme Initiated Under the Agricultural Adjustment Act in the United States, by W. C. Hopper; Discussion of Marketing Legislation, by W. M. Drummond; Grain Markets and Canada's Position, by C. B. Davidson; Some Factors Influencing the Export of Canadian Tobacco, by T. G. Major; A Brief Discussion of the Relationship of Investment to International Trade, by A. E. Richards; and Les Caisses Populaires Dans la Province de Quebec, by Charles Gagné.

The need of historical materials for agricultural research, E. E. EDWARDS (*Agr. Hist., 9 (1935), No. 1, pp. 3–11*).—The need of historical materials, materials that should be collected and preserved, and existing institutions collecting such materials are briefly discussed.

The Spanish land-grant system as an influence in the agricultural development of California, R. H. ALLEN (*Agr. Hist., 9 (1935), No. 3, pp. 127–142*).—This is a paper presented at the joint session of the Agricultural History Society and the American Historical Association at Washington, D. C., December 29, 1934.

Social and economic factors in land-use planning in the Northeastern States, J. G. LIPMAN (*Econ. Geogr., 11 (1935), No. 3, pp. 217–226, figs. 5*).—The changes that have taken place in agriculture in the Northeastern States, the present trends, and the factors to be considered in land-use planning in the area are briefly discussed.

The planning of submarginal land projects, L. R. SCHOENMANN (*Amer. Soil Survey Assoc. Bul. 16 (1935), pp. 33–35*).—The choice of submarginal lands for government purchase and some of the uses to which purchased lands can be put are outlined.

Part-time farming in four representative areas of Kentucky, M. OYLER and W. W. ROSE (*Kentucky Sta. Bul. 358 (1935), pp. 119–150, fig. 1*).—This study was made in cooperation with the Federal and Kentucky Emergency Relief Administrations. Data were collected covering the year ended March 31, 1934, from 100 part-time farmers near Louisville, 100 near Lexington, 43 near Richmond, and 86 near Corbin and Barbourville. Tables are included and discussed showing the age, education, farming experience, etc., of the farmers, acres operated and in crops, investments, debts, farm receipts and expenses, farm privileges, income, operator's earnings from farm, size of families, etc. The relation of farm business to amount of outside income and operator's net earnings are also analyzed. The distance from nonfarming employment and selection of a part-time farm are discussed.

Forty-two percent of the farms were less than 2½ acres in size, and the acreage in crops was ½ acre or less. The total average investment was nearly $4,000. The average investment in livestock and machinery was $82 for owners and $41 for renters. The average total income of the families was $1,311, of which 67 percent was from work off the farm, 6 percent farm receipts, 11 percent food furnished from the farm, and 15 percent rental value of dwelling. The total average earnings per farm operator were $34 from the farm and $899 from other sources. Approximately one-third of the families were young couples with few children and retired couples. Production of food for home use and enjoyment of country life were the chief advantages of part-time farming.

Types of farming in Kentucky, B. POUNDSTONE and W. J. ROTH (*Kentucky Sta. Bul. 357 (1935), pp. 19–118, figs. 26*).—The object of this study, made in cooperation with the Bureau of Agricultural Economics, U. S. D. A., was to ascertain what types of farming are found in the State, to determine the areas in which certain types predominate, and to learn the causes which produced these type-of-farming areas. The character of the agriculture of the State, the forces affecting it, and the types of farming are described. The State is divided into 8 type-of-farming areas and 23 subareas. These are described and discussed.

Readjusting Montana's agriculture.—I, The need and basis for readjustment, R. R. RENNE (*Montana Sta. Bul. 306 (1935), pp. 24, figs. 7*).—The economic changes outside of agriculture and in agriculture and their significance to Montana and the fundamental facts necessary to promote a plan for readjustments are discussed.

Rural zoning, C. I. HENDRICKSON (*U. S. Dept. Agr., Bur. Agr. Econ., 1935, pp. [1]+38*).—The objectives, history, and legal aspects of zoning, the regulations affecting agriculture, and the place of rural zoning in the land program are discussed. A list of selected references is appended.

A study of ranch organization and operation in north-central Texas (*U. S. Dept. Agr., Bur. Agr. Econ. and Bur. Anim. Indus., 1936, pp. [2]+73, figs. 4*).—Ranch expenditures and receipts, and livestock inventories for 15 ranches in 1920–22, 40 in 1923, 39 in 1924, and 31 in 1925 are analyzed, the ranches being grouped into 5 groups according to size—300 cows or less, 301 to 500 cows, 501 to 700 cows, 701 to 900 cows, and more than 1,300 cows. The area studied, the utilization of resources, and steer prices are described. Analysis by ranch groups covers investment, labor, different phases of ranch management, marketing, expenses, depreciation, income, returns per acre, etc. The operation of individual ranches of different sizes is described and discussed, and suggestions are made regarding the operation of small, medium-sized, and large ranches.

Some economic aspects of the farm poultry enterprise, H. E. GOLDEN (*Missouri Sta. Res. Bul. 227 (1935), pp. 92, figs. 9*).—A brief history (pp. 4–22) is given of poultry culture, including the development of the art of incubation, artificial brooding, the baby chick industry, refrigeration, and methods of shipping eggs and poultry. The development and present status of the poultry industry in different countries and flock management in the program of American farming are discussed. Analysis of the land, labor, and capital requirements, cost of operation and maintenance, income from sales of products, and the efficiency of management in the poultry industry is made, based upon the following records of the station: 69 dairy records for the period 1924–31, figures on 1,127 demonstration flocks for the seasons 1924–25 to 1929–30, and reports from 98 farmers in Linn County setting forth in detail their financial operations for 1932. An extensive bibliography is appended.

Changing status of the Iowa dairy industry, A. MIGHELL (*Iowa Sta. Bul. 338 (1935), pp. 361–416, figs. 17*).—"The purpose . . . of this study is to trace the importance of changing external factors on the Iowa dairy industry. It stops short at the point where a study of efficiency in the individual plant would begin." The first part deals with the farm dairy industry, and describes and discusses the number of milk cows and other cattle, size and productivity of dairy herds, the changes in intensity of dairying and the factors responsible for the recent trends, the disposition of and income from farm dairy products, and the utilization of products sold. The second part deals with the status of dairy manufacturing in the State, the development and current condition of the creamery butter industry, and the economic problems in Iowa creameries.

Creamery business analysis, L. L. ULLYOT and H. F. HOLLANDS (*Minnesota Sta. Bul. 322 (1935), pp. 48, fig. 1*).—"The purposes of this bulletin are to indicate the general types of information that should be included in an annual creamery report, to show patrons and other persons how to analyze and interpret such a report, and to indicate the general financial condition and the operating efficiency of the cooperative creameries included in the study."

The data used were obtained from the 1931 audit reports of 117 cooperative creameries in Minnesota and the annual reports for that year made to the Minnesota Department of Agriculture, Dairy, and Food.

Cost of producing milk in New Jersey.—Preliminary report, A. G. Waller and J. W. Carncross (*New Jersey Stas., 1935, pp. [3]+63, figs. 7*).—This is a mimeographed preliminary report on an extensive study of the cost of producing milk in various parts of New Jersey, August 1933 to April 1935, made in cooperation with the Bureau of Agricultural Economics, U. S. D. A., and dairy herd improvement associations. It is based chiefly on the records for 176 farms in 8 areas of the State, with an average total number of cows of 4,089. Analysis is made for all farms and by areas of costs by months; trends in milk prices; seasonal costs; relation of cost to production per cow, size of herd, grain concentrates fed per cow, percentage of butterfat in milk, and breeds; corn silage costs; dairy farming income and expenditures; etc.

An economic study of the wheat industry in the Union [of South Africa], W. J. Pretorius (*Union So. Africa Dept. Agr. and Forestry Bul. 141 (1935), pp. 81*).—The wheat position of South Africa is reviewed. The data collected during the years 1929–30 to 1931–32 in the Western Cape Province are summarized and compared in chapters on Farm Organization, Farm Income and Expenditure, Factors Influencing Financial Success, Production Costs of Wheat, and the Principal Factors Influencing Profit.

The importance of the vegetation factor in water conservation and erosion control, R. V. Allison (*Amer. Soil Survey Assoc. Bul. 16 (1935), pp. 119–122*).—According to a discussion contributed from the U. S. D. A. Bureau of Chemistry and Soils, "it appears that erosion control methods are possible . . . for practically any reasonable situation, and that good progress is being made in working out a great number of these; also that there is a steadily increasing appreciation of the value of vegetation in one way or another in the varied programs that are being set up for this purpose." The author feels, however, that "our most difficult problem in the entire field of soil and water conservation lies in the essential inertia and indifference of the individuals concerned; also that this indifference is largely grounded in the antiquated ideas of land ownership that prevail at the present time—ownership rights that apparently permit a man to completely incapacitate or even entirely destroy the soil on his farm in 5, 10, or 20 yr. by the sheer crudeness of his methods of handling."

Drought loses its terrors: Fodder conservation in the central west (*Agr. Gaz. N. S. Wales, 46 (1935), No. 9, pp. 491–493, fig. 1*).—From a study of the situation in the drier parts of New South Wales, it is concluded that "drought holds few terrors for the farmer or grazier who has stored up adequate fodder reserves", and as confirmation of this statement a 1,161-acre farm is cited, of which 110 acres is seeded to alfalfa, chiefly for grazing purposes, 250 acres to wheat, 50 acres to oats, and 400 acres in fallow. "Any scarcity of feed in the paddocks at any period is well provided for by ample reserves, which include 298 tons of silage made from wild oats and conserved in 3 trench silos, 142 tons cereal hay in 10 small round stacks, 41 tons lucerne hay in 5 stacks, and 78 tons of wheat grain stored in galvanized iron silos."

Factors affecting farm land values in Missouri, C. H. Hammar (*Missouri Sta. Res. Bul. 229* (*1935*), *pp. 62, figs. 34*).—This study was made from an appraisal viewpoint to ascertain the effects of physical, economic, and social factors on land values. Included and discussed are maps showing the topography and texture, the depth, the nitrogen, potassium, phosphorus, and clay content, and the lime requirements of soils of the State. Tables, correlations, and charts show the relations of these factors to productivity of soil and land value. The effects of location, home features, capitalization rates, exceptional costs, threatening physical deterioration, exceptional risk, and exceptional speculative interest on land values are also discussed.

The relation between physical characteristics and land values and average yield of crops were found to be strikingly high, and consequently these factors can be used as a basis of judging or appraising land values or productivity. The effects of external economic factors are diverse and are not susceptible of generalized analysis. Capitalization rates and taxes were found to be high in areas of poor land, and low in areas of good land. A large acreage in the State is subject to exceptional risks due to flood hazards and single-crop farming. Erosion is a powerful land value depreciating factor in the State, and no appraisal of land values can be complete until some effort can be made to forecast the future effects of erosion. In general, regions of exceptional speculative interest were found to be those with the most actively increasing population.

Agricultural holdings and tenant right, C. E. Davies (*London: Estates Gaz., Ltd.,* [*1935*], *3. ed., pp. 503*).—Included is a treatise on the law relating to agricultural holdings in Great Britain (E. S. R., 48, p. 594), a chapter on The Practice of Tenant-Right Valuation, by N. E. Mustoe; a chapter on Customs of the Country, by J. E. Tory; the text of acts relating to agricultural holdings; and tables of statutes and cases.

Farmers' and farm laborers' strikes and riots in the United States 1932–1935: A list of references (*U. S. Dept. Agr., Bur. Agr. Econ., 1935, pp.* [*3*]+*83*).—This is a mimeographed annotated list of 678 references.

Trend of taxes on farm and ranch real estate in Texas, L. P. Gabbard (*Texas Sta. Bul. 512* (*1935*), *pp. 21, figs. 3*).—The data upon which this bulletin is based were obtained in cooperation with the Bureau of Agricultural Economics, U. S. D. A., from the county and independent school district tax rolls in 160 counties of the State. The sample for each county consisted of five farms fairly representative of the agricultural interests of the county. Tables and charts shown by years, 1913–33, the indexes (1913=100) of farm real estate taxes for the State as a whole, and the weighted farm taxes per acre in each of the 19 type-of-farming areas and in each of the 160 counties.

The average tax per acre on farm and ranch real estate rose from 8.4 ct. in 1913 to 26 ct. in 1931, and then decreased to 19.6 ct. in 1933. The ratios of taxes to prices of farm products (1913=100) ranged from 0.66 to 1.27, averaging 0.93, during the period 1913–20; from 1.39 to 1.90, averaging 1.61, for the years 1921–25; from 1.85 to 2.72, averaging 2.15, for the years 1926–30; and were 4.43, 4.90, and 3.63, respectively, for the years 1931, 1932, and 1933.

The extreme range of variation of taxes in the State in 1933 was from 3.7 ct. per acre in the Edwards Plateau Grazing area to 299.7 ct. in the Lower Rio Grande Valley Irrigation area. Relative to 1913, taxes in 1933 ranged from 171 percent in the Post Oak and Interior Prairies areas to 692 percent in the Lower Rio Grande Valley Irrigation area.

The effect of the Michigan 15 mill tax limitation on forest property and communities, P. A. Herbert (*Jour. Forestry, 34* (*1936*), *No. 1, pp. 4–9*).—The tax levies and assessed values in 1932 and 1933 in northern Michigan are discussed. Tax levies decreased 47 percent in the counties of the Lower Peninsula, and 37 percent in the forest and 44 percent in the mineral counties of the Upper Peninsula.

International yearbook of agricultural legislation, 1934 [trans. title] (*Inst. Internatl. Agr.* [*Roma*], *Ann. Internatl. Lég. Agr., 24* (*1934*), *pp. LXX+922*).—This volume continues the series previously noted (E. S. R., 72, p. 270).

Facts relating to the agricultural situation in 1934, L. H. Bean (*U. S. Dept. Agr., 1934, pp.* [*5*]*+75+*[*2*], *figs. 26*).—This is a statement prepared for hearings before the Interstate Commerce Commission on increases in freight rates and charges, 1934. It includes data on changes in agricultural production, exports, prices and income, price and cost disparities, the agricultural outlook for 1935, and the dependence of further agricultural recovery on balanced production and further industrial expansion.

Agricultural outlook for Illinois, 1936, H. W. Mumford (*Illinois Sta. Circ. 442* (*1935*), *pp. 31, figs. 8*).—This circular "contains facts and estimates based on the available information concerning the current and probable future supplies of and demand for farm products. A discussion of the supply of and price of commodities which farm families purchase is also included."

Agricultural relief measures relating to the raising of farm prices (*U. S. Dept. Agr., Bur. Agr. Econ., 1935, pp. 27; 76; 59*).—These three mimeographed publications include annotated lists of the bills, resolutions, documents, etc., and hearings classified under major subjects on plans considered in the Congress December 5, 1927, to March 3, 1929, compiled by L. O. Bercaw; and April 15, 1929, to March 3, 1931, and December 7, 1931, to March 3, 1933, compiled by V. H. Fischer.

Wheat and the AAA, J. S. Davis (*Washington, D. C.: Brookings Inst., 1935, pp. XVII+468,* [*figs. 22*]).—This is the first of a series of publications of the Brookings Institution setting forth factual details of the A. A. A. program for different commodities, and presenting the institute's interpretation and critical analysis of the significance and value of the results obtained. The wheat background of the Adjustment Act, the act, and the wheat program are described. Detailed analysis is made of the central element of the program, i. e., the application of the "voluntary domestic allotment plan", of supplemental elements, including grain exchange regulations, surplus relief operations, and the Pacific Northwest export and the international wheat agreements, and of the early results of the program, the attitude towards it, and the immediate outlook. The final chapter sets forth the author's appraisal of the plan based on the materials assembled and analyzed and his experience in wheat economics and his general economic philosophy.

An appendix includes statistical tables.

The dairy industry and the AAA, J. D. Black (*Washington, D. C.: Brookings Inst., 1935, pp. XIV+520,* [*figs. 30*]).—This volume is one of the series noted above. Chapters deal with the position of dairy products under the Agricultural Adjustment Act, the dairy industry, the dairy situation, 1930–33, fluid milk marketing agreements, milk markets under licenses, price relations within milksheds, seasonal variations and adjustments, operating problems of fluid milk markets, alternatives in public control, the applications of control, the State milk control boards, other dairy products, the production control undertakings, and the problem of production control. The final chapter summarizes and makes an appraisal of the operations of the A. A. A. and discusses the outlook.

Appendixes include the provisions of the Agricultural Adjustment Act relating to dairy products, statistical tables, the method of computing parity prices for dairy products, excerpts from C. L. King's discussions of dairy policy, amended license for milk—Detroit, Michigan, sales area, other State milk control acts, and excerpts from 1935 amendments to the Agricultural Adjustment Act.

The agricultural policy in action, C. S. Orwin (*Jour. Roy. Agr. Soc. England, 95 (1934), pp. 1–17*).—The steps that have been taken with the facilities afforded by The Agricultural Marketing Act, 1933, and other legislation in pursuance of the national policy and questions arising in the operation of the policy are discussed.

Vegetable marketing in England and Wales (*[Gt. Brit.] Min. Agr. and Fisheries, Econ. Ser. 25 (1935), pp. VI+256, [pls. 28], figs. [6]*).—This report is designed "to provide a general picture of present-day marketing conditions in respect of some 40 different kinds of vegetables produced commercially in this country for human consumption, and to indicate the directions in which there seems to be scope for the adoption of improved methods." Supplies, assembling, preparation for market, transportation and distribution of home-produced and imported vegetables, storage of and publicity in marketing vegetables, and vegetables in the diet are discussed.

Report of the reorganisation commission for fat stock for England and Wales (*[Gt. Brit.] Min. Agr. and Fisheries, Econ. Ser. 39 (1934), pp. 129, figs. 5*).—This is the report of the commission appointed December 21, 1932, to prepare a scheme or schemes for regulating the marketing of fat stock. The volume and seasonality of supplies 1927–31, regulation of imports 1932–34, future supply regulations, the marketing scheme recommended, market intelligence, production, slaughter problems, etc., are discussed.

Eggs and poultry, F. N. Blundell et al. (*[Gt. Brit.] Min. Agr. and Fisheries, Econ. Ser. 43 (1935), pp. IV+105*).—This is the report of the reorganisation commission for eggs and poultry for England and Wales appointed January 25, 1935. It includes chapters on the supply and prices of eggs and table poultry, factors affecting imports since 1930, the objectives of an import policy and alternative methods of such policy, liquid and dried eggs, recommendations as to import policy for eggs and for table poultry, and coordination problems.

Crops and markets, [December 1935] (*U. S. Dept. Agr., Crops and Markets, 12 (1935), No. 12, pp. 481–560, figs. 3*).—Included are (1) the usual livestock estimates, market reports, and tables and charts on the price situation, and (2) the final crop reports for different crops for the year 1935.

The first world agricultural census: Chile, New Zealand (*Internatl. Inst. Agr. [Roma], First World Agr. Census Buls. 3 (1935), pp. 15; 4 (1935), pp. 48*).—These bulletins continue the series previously noted (E. S. R., 71, p. 270).

World wheat survey and outlook, September 1935, M. K. Bennett, J. S. Davis, and A. E. Taylor (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 12 (1935), No. 1, pp. [2]+34, figs. 6*).—Data as of September 1935 are presented.

Mutton and lamb survey: A summary of production and trade in the Empire and foreign countries (*London: Imp. Econ. Com., 1935, pp. 294, [pls. 7]*).—This volume is the second in the series previously noted (E. S. R., 73, p. 405). Analysis is made of the production and consumption of and trade in mutton and lamb in all important countries of the world, and of the course of prices of these commodities in Great Britain.

Revised estimates of potato acreage, yield per acre, and production, 1866–1929 (*U. S. Dept. Agr., Bur. Agr. Econ., 1935, pp. 57*).—This mimeographed publication includes tables showing the revised estimates of potato acreage, yield, and production for the United States as a whole and by regions and States, 33 States being included for 1866, 34 from 1867–78, 38 from 1879–81, 45 from 1822–84, 46 from 1885–95, 47 from 1896–98, and all the States since 1899. The estimates by States are generally higher for the period 1881–94, and lower for the period 1911–29 than the original estimates published. In no case do the estimates for the United States vary more than 15 percent from the original estimates.

Revised estimates of tobacco acreage, yield per acre and production, 1866–1929 (*U. S. Dept. Agr., Bur. Agr. Econ., 1935, pp. 29*).—In this mimeographed publication, tables show the revised estimates of tobacco acreages, yields, and production for the entire United States and by regions and States. The estimates of production include 15 States in 1866–68, 16 in 1869–88, 17 in 1889–96, 18 in 1897–98, 19 in 1899–1919, 17 in 1920–23, and 18 in 1924–29. The revised estimates 1866–1909 for the United States are generally higher than those originally published, especially for the period 1891–1908. In some years the increase was as much as 90 percent, due primarily to the increase in estimated acreage. Since 1909 there have been no material variations from the original estimates.

The calculation of the annual cost of farm machinery and implements, J. Wyllie (*Jour. Roy. Agr. Soc. England, 93 (1932), pp. 45–67*).—The proper method of ascertaining and apportioning costs, especially repairs, renewals, depreciation, and interest is discussed.

Index numbers of prices received by farmers for farm products, 1910 to 1935, A. G. Peterson (*U. S. Dept. Agr., Bur. Agr. Econ., [1935], pp. [2]+72+[1], pls. 9*).—This is a series of revised (E. S. R., 72, p. 860) monthly and annual index numbers, January 1910 to September 1935, for 34 major farm products and 13 commercial truck crops. "The principal changes are (1) the use of improved price series for dairy products and tobacco, (2) the addition of the prices of 20 products including a group of truck crops, and (3) shifting the weights from the marketings of the 1918–1923 period to those of the 1924–1929 period. . . .

"The revision raises the index number of prices received for farm products in 1933 from 63 on the old basis to 70 on the new, and raises the average for May 1934 from 74 to 82 percent of pre-war. The change from the old to the new varies from 2 points under, in 1915, to 10 points above, in 1928. According to the revised series, agricultural prices missed pre-war 'parity' in 1925 by 1 point and fell to 39 points under pre-war parity in 1932; whereas, measured by the old series, farm prices in 1925 were still 6 points under parity, and declined to 47 points under parity in 1932."

Prices of Illinois farm products, 1931–1934, L. J. Norton and T. R Hedges (*Illinois Sta. Bul. 422 (1935), pp. 73, figs. 33*).—This bulletin continues the study previously noted (E. S. R., 64, p. 786). The trends of prices of Illinois farm products 1921–34, the reason for the general price rise 1933–34, and the outlook are discussed. Comparisons are made of prices of individual farm products and of the prices of farm products and goods purchased by farmers 1931–33 and 1934, the changes in crop production 1920–34, and the numbers of livestock on farms 1921–29 and 1931–33, and of exports of lard, pork, wheat, and flour.

The average prices of Illinois farm products declined to about 50 percent of the 1910–14 average for the first quarter of 1933, then rose to approximately the 1910–14 level by the end of 1934. The average prices of 7 grains 1931–33 were about 44 percent of the 1921–29 average, that of 5 livestock and poultry products 50 percent, and that of 7 classes of livestock 59 percent. The analysis of the range of the prices of various products in the successive Septembers 1930–34 suggests a rather definite division of the prices in relatively high and relatively low price groups, resulting not from any common cause but from the chance operation of various influences. All the rise due to the gold devaluation policy that can be expected in the prices of staple products, such as grains, occurred early in 1934. One of the most important present problems is the extent that the prices of animal products that have not been directly affected by gold devaluation will be influenced by the upturn in the general price level generated by increased business activity, employment, etc., and the height to which the general price average will rise.

The acreage changes in Illinois from the period 1920–28 to the period 1930–32 due to changed price relationships were decreases of 60 percent in rye, 29 percent in wheat, and 28 percent in hay, and increases of 5 percent in barley and 244 percent in soybeans.

During the period 1931–33 prices of Illinois farm products averaged 51 percent of the prices prevailing in 1921–29; prices of goods bought by farmers for use in farm operations averaged 78 percent; and prices for goods bought by farmers for use in farm homes 71 percent. In 1934 2 percent more products were required to puchase a given quantity of farm supplies than in 1921–29, and 19 percent more than in 1910–14.

World wheat prices, Canadian-Argentine spreads and the Ottawa agreement, A. E. Taylor (*Wheat Studies, Food Res. Inst.* [*Stanford Univ.*], *12* (*1935*), *No. 2, pp.* [*2*]+*35–56, fig. 1*).—Data on these topics are presented.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Financing Montana schools, R. R. Renne (*Montana Sta. Bul. 307* (*1935*), *pp. 16, figs. 4*).—This is "a summary of the more important findings of a detailed study of the system of financing elementary and secondary education in Montana." The weaknesses of the present system are discussed and a reorganization program outlined.

Agriculture: Outlines of instruction for educational advisers and instructors in Civilian Conservation Corps camps (*U. S. Dept. Int., Off. Ed., Vocat. Div., Civ. Conserv. Corps, Vocat. Ser. No. 1* (*1935*), *pp. X*+*74*).—Included are outlines for 12 one-hour lessons each in a general survey course of agriculture, and a course on poultry production.

FOODS—HUMAN NUTRITION

[Studies in foods and nutrition at the Arkansas Station] (*Arkansas Sta. Bul. 323* (*1935*), *pp. 5–7, 36–39*).—Progress reports are given on studies by B. Sure, M. C. Kik, and K. S. Buchanan on enzymatic efficiency in avitaminosis; by Sure, Kik, Buchanan, H. S. Thatcher, and A. F. DeGroat on enzymatic efficiency in malignancy; by M. E. Smith on the effect of vitamin A deficiency on concentration of blood lipids of albino rats (E. S. R., 72, p. 883) and factors affecting the quality of canned tomatoes, and by Smith and W. L. Bleecker on the causes and prevention of spoilage of home-canned vegetables.

Effect of interior temperatures of beef muscle upon the press fluid and cooking losses, A. M. Child and J. A. Fogarty (*Jour. Agr. Res.* [*U. S.*], *51* (*1935*), *No. 7, pp. 655–662*).—With the use of the pressometer described previously (E. S. R., 72, p. 132), the press fluid from 32 pairs of beef roasts heated to internal temperatures of 58° and 75° C. was studied at the Minnesota Experiment Station. The roasts consisted of the eye muscle from the bottom round of choice quality beef from the packing house, ripened 14 days. The muscle was dissected carefully and freed from exterior fat, leaving a continuous covering of connective tissue surrounding the muscle. The samples were paired by using the anterior portion for the lower temperature and the posterior for the higher temperature. The press fluid was analyzed for moisture and total and noncoagulable nitrogen.

On the basis of statistical analysis, the ratio of press fluid to dry matter was greater in muscle heated to 58° than in that heated to 75°. Approximately 11 percent more press fluid was found in the muscle heated to 58° than in that heated to 75°. Chemical analysis of the press fluid showed that the moisture content of press fluid varies directly with the interior temperature. An inverse relationship exists between the total nitrogen content of press fluid and the interior temperature. There is comparatively little difference in the noncoagulable nitrogen in press fluid from muscles heated to 58° and 75°. The coagulable nitrogen fraction in press fluid varies inversely with the interior temperature. An inverse relationship exists between the percentage of press fluid and the total cooking losses in muscle heated to 75°. No relationship is indicated between the percentage of press fluid and the total cooking losses in muscle heated to 58°.

Classification of fruits and vegetables according to their carbohydrate content, G. Adams and C. Chatfield (*Jour. Amer. Dietet. Assoc., 10 (1935), No. 5, pp. 383–390*).—This contribution from the U. S. D. A. Bureau of Home Economics presents a new classification of fruits and vegetables according to their carbohydrate content and based upon a careful study of the carbohydrate distribution in a comprehensive list of foods. Both fruits and vegetables are classified in the same six groups from 3 percent with class intervals of 3 percent to 18 percent. The figures on which the new classification is based are those for nitrogen-free extract or total carbohydrate excluding fiber. In addition to the group lists, data are given on the average values for calculation of protein and fat for each of the groups, and the carbohydrate, protein, and fat content of vegetables and fruits containing more than 18 percent carbohydrate, and of a miscellaneous group, which because of the nature or quantity of certain constituents, must be considered individually. Various suggestions are given for the use of the new table.

[Factors affecting the quality of peach preserves], H. H. Moon, C. W. Culpepper, and J. S. Caldwell (*U. S. Dept. Agr. Circ. 375 (1935), pp. 16–19, 20*).—In connection with the varietal study noted on page 780, alterations in the usual method of preserving peaches by open-kettle cooking were tested with the Elberta variety. The effect of cooking equal quantities of the fruit and sugar to end points ranging by 1° intervals from 104° to 109° C. was first tested, with the conclusion that for this variety and presumably other melting-fleshed varieties boiling to an end point of 107° gave a product of the most desirable consistency and of good flavor, although the natural peach flavor was preserved most satisfactorily at a slightly lower end temperature, 104°.

The other variable studied was the proportion of fruit to sugar, all peaches being cooked to the end point of 107°. Five lots varying from 41.7 percent fruit and 58.3 percent sugar to 58.3 percent fruit and 41.7 percent sugar were tested, with the conclusion that, considering all factors, the product made from equal parts of fruit and sugar was the most desirable. The batch containing 45.8 percent of fruit was regarded as most pleasing in flavor but was distinctly too thin. With proportions of fruit higher than 50 percent, the greater length of time required to reach the boiling point caused injury to color and flavor. It is pointed out that the exact proportions of fruit and sugar which will yield the best product will probably vary with the variety, and that the nonmelting-fleshed varieties may advantageously have a slightly higher proportion of fruit to sugar than the melting-fleshed varieties such as the Elberta. This is probably also true of varieties low in acidity.

Sulfuring of apples before drying, M. Baldelli, A. M. Child, D. Nelson, and R. B. Harvey (*Minn. Hort., 63 (1935), No. 9, pp. 168, 169, 171, fig. 1*).—This contribution from the Minnesota Experiment Station discusses the purpose of sulfuring apples before drying, and gives simple directions for sulfuring sliced or cored apples on a small scale in the home, for drying the unsulfured and sulfured fruit, for conditioning the dried fruit, and for using the sulfured and dried apples in cooking.

Efficiency of methods and products for sterilization of beverage glasses, E. D. Devereux and W. L. Mallmann (*Amer. Jour. Pub. Health, 26 (1936), No. 2, pp. 165, 166*).—Laboratory tests of various disinfectants suggested for sterilizing beverage glasses were made by introducing cultures of *Escherichia coli* and *Staphylococcus aureus* into solutions of the disinfectants and determining by plate counts the number of organisms surviving after exposure of 15, 30, 45, 60, 90, 120, and 180 sec. and 5 and 10 min.

Hot water as employed in a mechanical dishwasher was found to be very satisfactory for sterilizing glasses provided a minimum temperature of 160° F. (71° C.) was maintained. Of the disinfectants tested, the sodium and calcium hypochlorites proved most effective. Azochloramide and chloramine T were suitable for a sufficiently long exposure. Sodium chloride and trisodium phosphate were unsatisfactory. Calgonite, a detergent containing sodium metasilicate, when used in a concentration suitable to the hardness of the water employed destroyed *E. coli* in 15 sec. but had little or no effect on *S. aureus* in 30 min. A disinfectant known as Klemm's Cleaner was very effective but unsuitable because it produces an intense purple color and stains utensils.

The transport of food by rail, H. Hartley (*Jour. Soc. Chem. Indus., Chem. and Indus., 54 (1935), No. 30, pp. 690–698*).—This paper contains data on the sources of various classes of food supplies of Great Britain for 1933 and the amounts of certain foodstuffs conveyed over British and Empire railways in 1934, and a discussion of the causes of deterioration of food in transit, the construction of insulated vehicles and methods of cooling them, and the transport by rail under controlled conditions of certain types of perishable foods, including fresh and chilled meat; fresh, cured, and frozen fish; milk and cream; and soft fruit. The rapid transportation of small consignments of ice cream and the transportation by rail of bananas in heated cars to hasten ripening are discussed as illustrations of special problems.

National food policy (*Nature [London], 136 (1935), No. 3442, pp. 631–633*).—This is a brief summary of the discussion on economics of diet (with reference to a national food policy for Great Britain) before the sections of economics and physiology of the British Association at its 1935 meeting. It is pointed out that before a national food policy can be elaborated more information is needed along certain lines, as suggested by the following questions:

"What is the amount of increased consumption required to provide an adequate diet for every member of the community? To what extent can health be improved by increased consumption of certain foodstuffs? What effect would increased consumption have on British agriculture and on trade? What economic and financial measures are required to initiate and promote increased consumption?"

The food consumption habits of 145 Iowa farm families, P. M. Nelson, E. E. Hoyt, L. McLaughlin, and E. C. Morgan (*Iowa Sta. Bul. 337 (1935), pp.*

329–359, figs. 5).—This study is based upon records of expenditures for food and of food production for family use in the investigation of farm family living in Iowa reported on as a whole by Hoyt and Morgan (E. S. R., 66, p. 190). In all 145 yearly records were used, 43 obtained in 1926–27 near Ames in a general farming region in the central part of the State, 53 obtained in 1927–28 near Oelwein in a dairy region in the northeast part of the State, and 49 obtained in 1928–29 near Corning in a beef cattle raising section in the southwest part of the State. The food records, which were kept by the women in simple account books, were translated into pounds consumed per family per year of the more common food items and presented by individual families for the Ames group and as mean values for the other two. From these values the nutritive values of the respective diets were calculated in terms of adult male units and compared with standard allowances.

The diets of the 145 families furnished daily averages of 3,612 calories, 88 g of protein, 1 g of calcium, 1.58 g of phosphorus, and 0.015 g of iron per person. With the exception of iron for the Ames group, the average values for the different nutrients were in all cases in excess of the standard allowances. Considered by food groups, the consumption of meats, milk, and potatoes was high and of cereals very low. The consumption of fruits and vegetables (other than potatoes) was also low in the Ames group. It is thought that an increase in cereal consumption would be advantageous in decreasing the cost and improving the texture of the diets, and among certain families an increase in quantity and variety of vegetables would improve the iron content.

The average money value of the food per family per year was $549 for the group near Oelwein, $667 near Corning, and $720 near Ames, with an average of $639 for the entire number. In the Ames and Corning groups 62 percent, and in the Oelwein 55 percent of the total money value of the food was furnished by the farm.

A study of the Puerto Rican diet, L. ADDISS ET AL. (*Med. Woman's Jour.*, *42* (*1935*), *No. 4*, *pp. 94–98*, *fig. 1*).—This is the report of a committee of nutritionists in New York City who undertook to study the native food habits of the lower economic group in Puerto Rico in order better to give dietary advice to Puerto Ricans who have settled in New York City. A general summary is given of the native diet in Puerto Rico, with suggestions for making this more adequate for the Puerto Ricans in this country without altering too much native food habits. Combinations of milk with rice and the introduction of green vegetables into stews are suggested as practical means of making up for the most common deficiencies in the Puerto Rican diet.

Seasonal variations of growth in weight and height of Texas school children, J. WHITACRE (*Texas Sta. Bul. 510* (*1935*), *pp. 72*, *figs. 16*).—This bulletin analyzes in detail from the standpoint of possible seasonal differences and causes thereof the data on growth in weight and height of Mexican, white, and negro school children in San Antonio, Tex., obtained in the investigation other phases of which have been noted previously (E. S. R., 72, p. 136).

The average yearly net gains in weight per child were 7½ lb. for the white children and 8½ lb. for the Mexican and negro children, the somewhat larger gains in the latter groups being attributed to slightly higher average ages. The average yearly gain in standing height was about 2 in. and in sitting height about 1 in. for all races.

For all three races slightly better average gains were made in the fall (October to January) than in the other seasons, the monthly gains for the four fall months averaging about 10 percent of the entire yearly gain. October was the month of greatest gains for all three groups, the average net gains ranging from 11.3 to 16.1 percent of the yearly gains. In contrast to this, in April, the month of poorest gains, the average net gains ranged from 1.4 to 6.4 percent of the yearly gains.

The relative gains of spring (February to April) and summer (May to September) were not consistent among the three groups. The negro group had almost as high an average monthly percentage of the yearly gain in summer as in fall and a distinctly lower rate of gain in the spring. Less difference was shown by the white children, and the relative gains in the different seasons by the Mexicans were not consistent for the 2 yr.

The records of individual monthly weight changes showed that all three races had higher ratios of gains to losses in the fall than in the spring. The chief racial differences found were in the ratio of gainers to losers, approximately three times as many white and Mexican children gaining as losing each month, while only twice as many negroes gained as lost.

The monthly records of about two-thirds of the 98 children who at no time showed losses in weight agreed with the trends shown by the average net gains of all of the children in that the rate of growth in the fall was greater than in either spring or summer. The other third had a higher rate of growth in either spring or summer than in fall. "This emphasizes the importance of considering each child individually in his course of growth. A child's failure to gain should not be attributed complacently to the season of the year. Too much departure from regularity of gain calls for special attention, although the degree of uniformity to be expected in normal growth must be determined by further study."

Seasonal variations in growth in weight did not appear to be influenced by sex, age, birth month, type of body build, or living conditions, nor could the excellent gains made in October and the poorer gains in April be explained by the food eaten for from 2 to 4 days during the weighing period, minor illnesses, or climatic conditions.

Growth in both sitting and standing height was fairly uniform throughout the year, with no consistent seasonal differences. "On the whole, the analysis of the data for the several age groups throws no additional light upon the question of seasonal variation of growth in height considered either alone or in connection with gains in weight."

A study of food freely selected by a college coöperative housekeeping group, R. Wheeler and R. Mallay (*Jour. Amer. Dietet. Assoc., 10 (1935), No. 6, pp. 453–458*).—This report summarizes food consumption data recorded during the college year 1933–34 for a group of 28 undergraduate women students doing cooperative housekeeping with no maid service.

The daily per capita food cost varied between 41 and 46 ct. in weekly periods from October to June, with an average of 43 ct. for the entire period. Fruits and vegetables headed the list in percentage of total food cost, 28.7 percent, followed by milk and cheese 20.3, meats and fish 19.5, cereal products 8.8, butter 6.2, sugar and sirups 4.3, eggs 3.8, fats other than butter 2.7 percent, and miscellaneous items made up the remaining 5.7 percent. From the total food consumption the average nutrients furnished per person per day were protein 70 g, calcium 0.92, phosphorus 1.32, and iron 0.0118 g, calories 2,397, vitamin A 6,616 units, and vitamin C 227 units. Iron is considered deficient. The average daily quantities per person of the principal items of food were ½ egg, 1 pt. of milk, 1.44 oz. of butter, 5¼ oz. of meats and fish, and more than 7 oz. of orange (edible portion).

Choice of formulas made by three infants throughout the nursing period, C. M. DAVIS (*Amer. Jour. Diseases Children, 50 (1935), No. 2, pp. 385–394, figs. 6*).—The author's experimental study of self-selection of diet by infants and young children (E. S. R., 60, p. 592) has been extended to three breast-fed infants taken from lying-in hospitals at the ages of 10, 8, and 7 days and subjected continuously to the experiment for periods of from 7.5 to 8 mo. For the feedings four preparations were used—a proprietary reconstructed milk (Similac), fermented lactic acid milk made daily, a simple milk dilution, and the orange juice, egg yolk, sugar, milk, and water formula of J. Hess. The plan followed was to offer each of these preparations successively at the same feeding and in rotation at successive feedings, allowing the infant to consume as much of each as desired before offering the next in the series. Intervals between feedings were 3 hr. during the day and whenever the infant waked at night at first, with gradually lengthening intervals until at the end of the experiment there were only 4 and occasionally 3 in the 24 hr. Undiluted orange juice was given twice a day between feedings. Tables and charts are given showing the number of daily feedings in successive months and their minimum, maximum, and average size for each of the three subjects and the quantities of each formula taken in successive months, with weight charts and other pertinent data.

The three infants were entirely free from digestive disturbances and were in excellent nutritive condition throughout the experiment. All three took relatively less lactic acid milk during the first 2 mo., but in the entire period two of the three took the largest amount of lactic acid milk and the third of the Hess preparation, which was also acid. The simple milk dilution was the least readily taken by all three infants.

Attention is called particularly to the wide variation in quantity taken at a single feeding. The maximum quantities in the first 3 mo. were first month from 5.75 to 6.75 oz., second from 8.5 to 9, and third from 9.5 to 11.5 oz. Minimum feedings were very small. In the opinion of the author the natural feeding habit is for meals of widely varying quantities. "Artificially fed infants appear to be the only large group on whom identical quantities for successive meals are meticulously imposed, and one cannot but wonder whether the comfort of these infants who exercised choice not only of formulas but of quantities and their complete freedom from digestive discomforts and symptoms of any sort were not due rather to the following of this natural eating pattern than to the combinations made by their choice of formulas."

Influence of a special cereal mixture on infant development, M. L. BLATT and I. E. SCHAPIRO (*Amer. Jour. Diseases Children, 50 (1935), No. 2, pp. 324–336, figs. 10*).—This paper reports a comparison of various indexes of growth and nutritional status of two large groups of children during the period from 6 to 30 mo. of age, carefully matched and kept under the same institutional conditions, with the only difference that one group of 70 received the special cereal of Tisdall et al. (E. S. R., 64, p. 391) and the other an ordinary cereal, all other items of the diet being the same for the two groups.

Composite curves are given for the two groups plotted at 2-week intervals for average weight, height, stem length, chest circumference, head circumference, bicrestal diameter, constitutional index, and hemoglobin content estimated by two methods. Observations on dentition and incidence of infection were made at each examination and X-ray examination of the wrists of both groups early in the study and at its end.

The data show that "the group fed the special cereal mixture exceeded the control group in weight, total length, stem length, and circumference of the chest and head. From the records of dentition it is seen that those fed the special cereal mixture had an earlier eruption of teeth. Hemoglobin curves show an advantage in favor of the group receiving the special cereal. No relationship was observed between the constitutional index and the incidence of infection."

[Longevity studies at the Cornell Station] (*[New York] Cornell Sta. Rpt. 1935, pp. 75, 76*).—Progress reports are given on experiments with rats, by C. M. McCay, M. F. Crowell, and L. A. Maynard, to determine the effect of retarded growth over long periods as a result of limited food intake upon subsequent growth and life span on unrestricted food intake (E. S. R., 73, p. 557), and by McCay, Maynard, H. S. Osgood, and Crowell on the effect of protein level on health after middle life.

Effects of long-continued cholesterol feeding in rats, W. M. SPERRY and V. A. STOYANOFF (*Jour. Nutr., 9 (1935), No. 2, pp. 131–155, figs. 2*).—The effect of long-continued cholesterol feeding has been studied in rats in relation to growth, efficiency of food utilization, resistance to infection, and deposition of cholesterol in tissues, with the following results:

The cholesterol-fed rats grew less well, ate less food, and utilized their food less efficiently than matched controls receiving the same synthetic diet without cholesterol, but this was not true of rats receiving cholesterol in addition to a natural-food diet. In the former large deposits of cholesterol were found in the liver, while in the latter the cholesterol deposits were small.

Except in a small series complicated by a probable vitamin G deficiency, rats fed diets high in cholesterol for long periods of time showed no greater resistance to the paratyphoid organism *Salmonella dansyz* than controls fed the same diet without cholesterol. Decreases in the cholesterol of the liver, adrenals, and lungs and increases in the cholesterol of the rest of the carcass (except the kidney in which no changes were observed) accompanied the parathyroid infection.

Increases in the cholesterol fractions of all tissues studied occurred after cholesterol feeding, but the increase was large only in the combined cholesterol of the liver.

A comparison of the mineral (base) composition of dietaries as determined from tables and by analysis, E. M. MACKAY and A. M. BUTLER (*Jour. Amer. Dietet. Assoc., 10 (1935), No. 5, pp. 398–400*).—Data are given on the weights of different food items in 10 diets, and the mineral composition of these diets as determined by actual analysis and by calculation from tables of average values, using Sherman's Chemistry of Food and Nutrition for sodium, potassium, and magnesium and analyses of various foodstuffs made at the Massachusetts General Hospital for calcium and phosphorus.

The calculated values for sodium were too high in all but two cases, for potassium too high in all cases, and for the other elements irregular. The authors conclude that "the mineral content of a general diet can only be computed satisfactorily from tables if it is wished to select diets solely with a view to a high or low content of the various elements."

Mineral exchanges of man.—IV, Variations in the mineral content of diets with a constant raw weight formula, S. H. BASSETT and H. E. VAN ALSTINE (*Jour. Nutr., 9 (1935), No. 2, pp. 175–189*).—This paper supplements the first in the series (E. S. R., 66, p. 589) by describing in detail a modification of one of the methods in general use for determining the mineral content of diets consumed by human subjects during the course of protracted balance experiments. In this method an aliquot portion of each item of food is weighed or measured at the time the diet is prepared, and the aliquots are pooled for analysis. For cooked foods in which the initial ingredients form a homogeneous mixture when cooked, the weight of each ingredient is increased by one-quarter of the amount the subject is to receive, and after the food has been cooked one-fifth of the total is reserved for analysis.

The analytical methods are described, and data are reported on the mean values, with standard deviations and coefficient of variation, of the mineral constituents of high and low calcium diets, as calculated from period-by-period analyses of the food, a comparison of the means with those calculated from Sherman's tables of average values, and the mean values, standard deviations, and coefficients of variation of 10 consecutive analyses from a single specimen of the high calcium diet.

In the period-by-period analyses, calcium and iron were the mineral elements showing the greatest variation in each series and potassium the element showing the least variation. In comparison with calculated values from the Sherman tables, the values for nitrogen, sodium, potassium, and magnesium in the high calcium diet were in fair agreement, while those for calcium, phosphorus, chlorine, and iron showed considerable variation. In the low calcium diets, all elements except sodium, magnesium, phosphorus, and chlorine showed differences greater than 10 percent. In the consecutive analyses of the same sample, the standard deviations were for the most part smaller than those found in the period-by-period analyses of the food. Magnesium and chlorine, however, showed wide variations.

The authors conclude that "when the same diet formula is repeated many times in consecutive metabolic periods and analyzed in each by the methods described, mean values of chlorine, magnesium, and probably of nitrogen may be computed and these values used as an approximation of the true intake in each period. Where calcium, sodium, potassium, and phosphorus are concerned, it seems advisable to compute the intake in each period from analysis of the sample of food collected in that period."

The state of calcium in the fluids of the body.—I, The conditions affecting the ionization of calcium, F. C. McLean and A. B. Hastings (*Jour. Biol. Chem., 108 (1935), No. 1, pp. 285–322, figs. 3*).—With the use of a biological method for the direct estimation of calcium-ion concentration in biological fluids with the isolated heart of the frog as indicator,[2] the authors have studied the factors concerned in the ionization of calcium in fluids of the human body, with results leading to the conclusion that "the ionization of calcium in the fluids of the body is determined chiefly by the protein content of the fluids, and that the relationship between calcium and protein can, as a first approximation, be described by a simple mass law equation yielding the ionization constant of calcium proteinate. From the standpoint of the ionization of calcium in protein-containing fluids, therefore, these fluids may be most simply thought of as solutions of calcium proteinate, which ionizes as a weak electrolyte into calcium and protein ions, with a residue of the un-ionized compound. With total calcium and total protein known, calcium ions may be readily calculated."

State of calcium in the fluids of the body.—II, Calcium in the blood in rickets, E. L. Compere, F. C. McLean, and A. B. Hastings (*Amer. Jour. Diseases Children, 50 (1935), No. 1, pp. 77–83, fig. 1*).—This continuation of the series of papers noted above reports calculated and observed values for the calcium-ion concentration of the blood serum of the 21 children serving as subjects in the investigation noted below.

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[2] Jour. Biol. Chem., 107 (1934), No. 1, pp. 337–350, fig. 1.

The mean of the observed values was 1.22, with a standard deviation of ±0.09 millimols per kilogram of serum water and of the calculated values 1.22, with a standard deviation of ±0.06 millimols. By giving equal weights to the observed and calculated values, the mean calcium-ion concentration of all observations was established at 1.22, with a standard deviation of ±0.08 millimols per kilogram of serum water as compared with 1.25, with a standard deviation of ±0.09 millimols obtained in the same manner from a smaller number of observations on the serum of a normal adult.

A clinical comparison of the antirachitic value of irradiated yeast and of cod liver oil, E. L. Compere, T. E. Porter, and L. J. Roberts (*Amer. Jour. Diseases Children, 50 (1935), No. 1, pp. 55–76, figs. 12*).—The subjects selected for this comparison were 21 infants from 5 to 30 mo. of age (all but 5 of whom were negroes) from a group of 83 with clinical evidence of rickets varying in severity from mild or doubtful to marked and definitely active. After division into five similar groups, the first group constituting a negative control was given a basal diet of milk, cereals, fruits, and vegetables, with no supplement of vitamin D, the second the same diet with 10.5 g of a cod-liver oil made up of equal quantities of four standard brands, and the other three groups the same diet with 0.417, 1.251, and 2.502 g, respectively, of irradiated powdered yeast. The experiment was continued for 3 mo., during which the condition of the children was judged by weekly weighings, determinations of serum calcium and phosphorus at intervals not less than 2 weeks, and roentgenograms of the wrists at intervals of 2 or 3 weeks. For 1 child on a basal diet, 1 receiving cod-liver oil, and 1 in the group receiving the largest amount of irradiated yeast, the retentions of calcium and phosphorus were determined for simultaneous periods of 20 days.

There was no serious illness in the entire group during the period of observation, and all of the children showed some gains in weight, from 0.1 to 1.2 kg, with an average gain of 0.8 kg. The yeast was well tolerated and caused no gastrointestinal disturbances.

The calcium content of the blood serum was relatively constant throughout the period, but phosphorus showed significant increases in all groups but the control and the group on the smallest amount of irradiated yeast. In discussing these findings, the authors express the opinion that " a study of the changes in the blood chemistry in rickets is probably not as significant as many observers have been led to believe. . . . The relatively normal amount of calcium content before, during, and after treatment in these cases and the significant changes in the phosphorus content made simultaneously confirm the impression of Hess and of others that the phosphorus content is much more important as a diagnostic factor in the study of rickets. There would seem to be little justification for the estimation of the calcium content and still less for considering the calcium-phosphorus product as a method of determining the presence or degree of rickets or the evidence of healing, since this multiplication by an approximately normal factor merely dilutes or decreases the more important factor of the phosphorus content."

The roentgenograms of the wrist bones showed healing in all but the negative controls and 3 of the subjects on the smallest amount of yeast. Complete healing, with restoration of the normal appearance of the bones, was observed in all of the patients receiving the medium and largest amounts of irradiated yeast. As the healing was equally rapid on these two doses, it was concluded that the optimum dosage is probably not more than 1.25 g daily. In the few subjects with very active rickets, the healing was more rapid and the appearance of the bones after 3 mo. of treatment more normal than in the one subject with severe rickets treated with cod-liver oil. However, in terms of rat units of vitamin D, from 1.1 to 3.3 times as much of the vitamin was required in the form of irradiated dried yeast as of cod-liver oil.

The retentions of calcium and phosphorus for the 3 subjects on whom balance experiments were run were as follows: The control, calcium 3 and phosphorus 9 percent; the subject receiving cod-liver oil, calcium 55 and phosphorus 37 percent; and the subject receiving the largest dosage of yeast, calcium 58 and phosphorus 39 percent. The authors are of the opinion that the most accurate and satisfactory method of estimating the degree of rickets and the effectiveness of any type of therapy is the determination of calcium and phosphorus balances.

Clinical manifestations of calcium deficiency in infancy and in childhood, H. T. Nesbit (*Amer. Jour. Diseases Children, 49 (1935), No. 6, pp. 1449–1471*).—A series of 36 case reports (infants and young children) is given in considerable detail in illustration of a syndrome of increased neuromuscular irritability and functional imbalance occurring in infancy and which is strikingly relieved by measures which improve calcium absorption. The frequency of emotional upsets, excessive apprehensivenes, sleeplessness, and tremor in the mothers of some of the infants is also noted. These symptoms also show prompt relief on calcium therapy.

The influence of sodium fluoride upon the basal metabolism of the rat under several experimental conditions, P. H. Phillips, H. E. English, and E. B. Hart (*Amer. Jour. Physiol., 113 (1935), No. 2, pp. 441–449, fig. 1*).—Recent reports in the literature of the therapeutic use of fluorides to control thyrotoxicosis (either through oral administration of fluorides or by the use of warm water baths containing hydrofluoric acid), together with observations of pathological changes in the thyroid glands in cattle in fluorine toxicosis, led to this investigation at the Wisconsin Experiment Station of the effects of sodium fluoride, desiccated thyroid, and potassium iodide, singly and variously combined, on the basal metabolism of rats. The sodium fluoride was fed at a level of 0.15, desiccated thyroid 0.25, and potassium iodide 0.0328 and later 1.64 percent of the ration.

A daily intake of sodium fluoride furnishing 27 mg of fluorine per kilogram of body weight had no serious effect on the body weight. This was also true of desiccated thyroid for the short time (3 weeks) in which it was fed. A combination of the two, however, caused a rapid loss in body weight, followed by collapse and death in from 2 to 3 weeks. A combination of potassium iodide at 0.038 and sodium fluoride at 0.15 percent of the ration had no marked effect on body weight.

The normal basal metabolic rate of the rats used in these experiments was 5.7 calories per kilogram per hour, or 861 calories per square meter of body surface per 24 hr. This was not changed appreciably by sodium fluoride, but was increased 35 percent in 21 days by the desiccated thyroid alone and 65 percent within 7 days by the desiccated thyroid and sodium fluoride. The addition of potassium iodide caused a temporary reduction in metabolic rate, which was not altered further by sodium fluoride. The fact that sodium fluoride increased the action of the metabolic stimulant in desiccated thyroid suggests that "insofar as the spontaneous 'hyperthyroidism' of toxic goiter and hyperthyroidism induced by the administration of desiccated thyroid are identical, to that extent NaF therapy is contra-indicated." The possibility is also suggested that since fluorine has been found to be present in fairly large quantities in many drinking waters, "fluorine may be an etiological factor in the syndrome of hyperthyroidism in susceptible persons."

Effect of iron and copper therapy on hemoglobin content of the blood of infants, C. A. Elvehjem, A. Siemers, and D. R. Mendenhall (*Amer. Jour. Diseases Children, 50 (1935), No. 1, pp. 28–35, figs. 5*).—An earlier study at the Wisconsin Experiment Station of the hemoglobin content of the blood of infants receiving no iron and copper medication (E. S. R., 70, p. 561) has been extended to a study by the same methods of the hemoglobin content of the blood of healthy infants before and after the administration of iron and copper in the form of ferric pyrophosphate and copper sulfate, either as a solution or in tablets containing 25 mg of iron and 1 mg of copper in the daily dose of 1 teaspoonful (5 cc) or 1 tablet, respectively. Of the 55 children studied, 37 received the solution, 10 the tablets, and 8 miscellaneous forms of iron and copper.

The results obtained, which are illustrated by individual curves of hemoglobin in grams per 100 cc of blood plotted against age in weeks, show that the iron and copper medication in the dosage given raised the hemoglobin content of the blood from between 9 and 11 g to from 12 to 13.5 g per 100 cc. In the case of infants suffering from severe nutritional anemia, the response to medication was fairly rapid. On 12.5 mg of iron and 0.5 mg of copper, the results were not as uniform or consistent. In a few studies in which iron alone was used, the response was slower and less extensive than on the same dosage of iron with the copper supplement.

"Our results suggest that it may be advisable to add small amounts of iron and copper to the diets of some infants to insure an optimum formation of hemoglobin. There is no doubt that the most desirable form of iron is that which is in simple combination and is known to be readily available. There may be some question about the exact type of salt to be used, but we have found the pyrophosphate to be satisfactory." The use of amounts of iron larger than 25 mg is discouraged because unpublished data have shown that the ingestion of large amounts of iron interferes seriously with the assimilation of phosphorus and leads to severe rickets in growing animals.

The relation of manganese to congenital debility, A. L. Daniels and G. J. Everson (*Jour. Nutr., 9 (1935), No. 2, pp. 191–203*).—In this investigation of the cause of the high mortality of the young of rats on a diet of milk supplemented with copper and iron but not manganese, a comparison was made of the reproduction and lactation records and the manganese content of the young at birth, weaning, and various periods thereafter to sexual maturity of rats on simple rations of milk supplemented with iron and copper, the same with manganese in addition, and a stock diet. The lactating ability of the animals on the first diet was tested by exchanging their young for vigorous stock young, or by replacing the young which died by vigorous stock young.

The young born of the animals receiving only iron and copper as supplements to milk contained 65 percent less manganese at birth than the young of mothers receiving manganese. Animals reared from weaning on a milk diet with no added manganese were able to suckle vigorous normal young to average weaning weights comparable to those of stock young or young receiving milk with added manganese, although their own young died.

Storage of manganese in the young during the suckling period was greater than subsequently on a cow's milk ration, but less than on milk supplemented with 1.5 mg of manganese per 100 cc of milk. The presence or absence of manganese in the milk did not affect the amount of milk consumed. No evidence of vitamin B insufficiency in the milk was obtained.

It is concluded that the high mortality of the young of animals receiving the milk-copper-iron diet is due to congenital debility as a result of a deficiency of manganese in the diet of the mother during gestation. "It would seem, therefore, that manganese is an essential constituent of the developing organism."

Increasing food values by mineralization and vitaminization, J. E. Becker (*Jour. Amer. Dietet. Assoc., 10 (1935), No. 5, pp. 391–397*).—This discussion deals for the most part with vitamin D, particularly the various methods now in use for enriching milk with this vitamin.

Vitamins A, D, and B in oysters—effect of cooking upon vitamins A and B, D. V. Whipple (*Jour. Nutr., 9 (1935), No. 2, pp. 163–173, figs. 3*).—The oysters used in this study were taken from Great South Bay, Long Island, in October 1932, shucked, washed in sea water, quick-frozen by the Birdseye process at —33° C. in half-pound packages, and kept at a temperature of —10° until used, when the frozen material was ground in a mortar, weighed out, and fed immediately. The cooked samples were prepared by removing several whole oysters from the package and heating them in a beaker on a steam bath for 10 min., after which they were ground and weighed out without discarding any of the liquid.

Chemical analyses, including ash constituents, are reported for the frozen oysters, as well as determinations of vitamin A and D content by the method approved for the U. S. Pharmacopoeia X and of vitamin B by the Chase and Sherman method. The mineral values are as follows: Calcium as CaO 0.1 percent, magnesium as MgO 0.09, sulfur 0.09, and phosphorus as P_2O_5 0.3 percent, and arsenic 1, copper 67, iron 33, and aluminum 134 p. p. m.

The vitamin A content of the raw oysters was approximately 3 U. S. P. units per gram, the vitamin D content 0.05 U. S. P. unit per gram, and the vitamin B (B_1) content approximately 1.5 Sherman units per gram. The oysters suffered very little loss in vitamin potency during the short cooking process. Attention is called to the discrepancy between the vitamin A and D values in the present study and those reported by Jones, Murphy, and Nelson (E. S. R., 59, p. 95), which were lower for vitamin A and higher for D. It is suggested that the differences may be due to the age of the oyster, the type of food, and the season.

The vitamin A content of commercially canned tomato juice and the vitamin G content of celery, O. K. Gant (*Colo. Univ. Bul. 367 (1935), pp. 21, 22*).—This summary states that the vitamin A content of several samples of commercially canned tomato juice ranged from 5.01 to 8.74, with an average of 7.12 Sherman units per cubic centimeter. Filtered juice ranged from 0.1 to 0.14, with an average of 0.12 unit per cubic centimeter.

The vitamin G content of the bleached leaves of pascal celery ranged from 1.11 to 1.29, with an average of 1.2 units per gram, and that of the celery stalks from 0.18 to 0.25, with an average of 0.21 unit per gram.

Studies on vitamin B_2 (G).—The non-identity of vitamin B_2 and flavins, C. A. Elvehjem and C. J. Koehn, Jr. (*Jour. Biol. Chem., 108 (1935), No. 3, pp. 709–728, fig. 1*).—Evidence is reported in this contribution from the Wisconsin Experiment Station leading to the conclusion that vitamin B_2, denoting the antipellagric factor in the vitamin B complex, is a chemical entity separate and distinct from the flavines.

Chicks were used as experimental animals, following the technic of Kline et al. (E. S. R., 69, p. 844), in which the development of pellagralike symptoms is considered evidence of lack of vitamin B_2 and its prevention with normal growth proof of the presence of this vitamin. In most of the work commercial liver extract (pernicious anemia fraction) and an extract prepared in the laboratory from autolyzed liver were used for tests of vitamin B_2 activity and the preparation of concentrates. Fresh pork liver was used in a few tests.

The vitamin B_2 in the liver extract proved to be readily soluble in concentrations of ethyl alcohol less than 95 percent, above which there was a partial separation of the vitamin between filtrate and precipitate. The vitamin was insoluble in ether and chloroform but soluble in amyl alcohol. On fractional precipitation of the liver extract with such solvents as ether, alcohol, and acetone and final extraction with amyl alcohol, a yellow-green fluorescent fraction of high vitamin B_2 activity was obtained. The activity of this fraction was not destroyed by exposure to sunlight or artificial light at its natural pH, but the fluorescence disappeared on exposure to sunlight.

Concentrates rich in flavines or lumiflavine prepared from autolyzed liver and liver extracts by the method of Kuhn (E. S. R., 72, p. 279) proved completely incapable of preventing pellagra in chicks. When a partially purified fraction from liver extract was treated with fuller's earth, the flavines were adsorbed on the fuller's earth and the filtrate retained its antipellagric properties. The flavine was removed from another fraction by conversion into lumiflavine and extraction with chloroform with appreciable reduction of the vitamin B_2 activity.

In the light of the nonidentity of the flavines and the antipellagric factor, as established in this study, some of the recent reports in the literature are reviewed and reinterpreted. Concerning nomenclature, the authors recommend the retention of the term vitamin B_2 for the antipellagric factor instead of for flavine, as suggested by György (E. S. R., 72, p. 282).

The vitamin C content of some Indian food-stuffs, S. Ranganathan (*Indian Jour. Med. Res., 23 (1935), No. 1, pp. 239–252*).—This report is presented in two parts. Part 1 includes a discussion of the methods followed and data obtained in chemical determinations of the vitamin C content of over 100 Indian foodstuffs. Part 2 reports studies on the effect of storage on the vitamin C potency of foods.

The method used for most of the foods was the 2,6-dichlorophenolindophenol method, following the technic of Bessey and King with slight modifications. With materials giving difficulty on account of pink or reddish colors developing in the acetic acid extract, the iodine titration method was used, with due recognition of the fact that the values thus obtained represent not only vitamin C but other substances capable of reducing iodine, and that consequently the values indicate only the maximum amount of vitamin C that could possibly be present. The foodstuffs were for the most part obtained on the local market. A few, stated to be fresh, were analyzed within from ½ to 1 hr. after they had been gathered from nearby vegetable gardens. Some of the foods tested, with their values in milligrams per 100 g or 100 cc of edible portion, are as follows:

Apples, ripe, 2.1, and skin, 2.6 mg; French beans, fresh and tender, 40.9, and from the market, 13.8; brussels sprouts, 71.8; cabbage, fresh inner leaves, 132.6, and outer leaves, 125.8; carrots, 2.5; cauliflower, 65.8; celery leaves, 62.4, and stalks 5.7; coconut water, 2, and kernel, 0.8; guava, country, ripe, 299, and hill variety, ripe and fresh, 11; lettuce, fresh, 14.9; lime juice from ripe fruit, 39.6, and peel, 115.1; orange juice, tight skin variety, 102.8, and peel, 156; papaya juice from ripe fruit, 41, fruit, 45.5, and outer skin, 71; parsley, 280.8; peas, English, empty pods, 25.5, and seeds, 9.2; persimmons, 6.1, and skin 0 to trace; pineapple juice, 75.9, and fruit, 62.9; plantain, unripe, used as a vegetable, 28.9; and peel, 0 to trace; radish, fresh, 15; rhubarb stalks, 36.7; and tomato, ripe whole fruit, 32.2, and juice, 33.8 mg percent. Food materials showing a trace only include fresh common pears, loquats, and preserved apricots, figs, and dates.

Attention is called to the suggestion of Bacharach et al. (E. S. R., 73, p. 728) that in fruits the vitamin C content decreases from the peel to the inner part, and it is pointed out that the present data confirm this for oranges, limes, papaya, and peas, but show the opposite for plantain, persimmons, and coconut. The data also show that the vitamin C content of a given product varies with locality, season of the year, rainfall, manuring, and the different stages of growth.

In the study of the effect of storage, a leafy vegetable (spinach) liable to relatively rapid deterioration and a fruit (orange) covered with a thick protective coating were examined. In the spinach tests, a large amount of the material was obtained fresh, the leaves were freed as far as possible from adhering soil and made up into 10-g fractions which were kept in paper packages at room temperature and tested at different intervals of time, the loss in weight due to evaporation being determined at the time of examination of each. Samples collected during dry and sunny weather (initial vitamin C content 36.92 mg per 100 g) and during wet weather (initial vitamin C content 53.3 mg per 100 g) were used. Oranges from the same lot were tested at definite intervals.

After 24 hr. the percentage loss in vitamin C from the spinach collected in dry weather was 47.2 or 30.3 percent, according to whether loss in weight due to moisture was or was not taken into account. After 192 hr. corresponding losses were 95.2 and 79.3 percent. The spinach collected in wet weather showed respective losses of 34.2 and 12.9 percent after 24 hr., and 87.5 and 40.7 percent after 192 hr. The losses in vitamin C were accompanied by increases in pH from 5.90 to 7.10. The results with oranges were not so clear-cut, as the same sample could not be used throughout. However, no appreciable losses were evident after 2 weeks' storage.

Vitamin C potency of vegetables (*New York State Sta. Rpt. 1935, pp. 42, 43*).—This is a progress report on an extensive investigation of the effect of various factors, including handling, storage, and cooking, on the vitamin C content of the principal vegetables grown in the State (E. S. R., 73, p. 727).

Elimination and storage of vitamin C in the human and animal body.—I, Determination of the vitamin C content of the urine of the inhabitants of sections of Sweden [trans. title], H. v. EULER and M. MALMBERG (*Biochem. Ztschr., 279 (1935), No. 5-6, pp. 338-352*).—This paper discusses possible sources of error in the determination of the ascorbic acid content of the urine by the Tillmans method, with the conclusion that at pH 2.5 there is no difference between the results obtained by titration of the urine before and after reduction by hydrogen sulfide.

Data are reported on the ascorbic acid content in milligrams per liter of urine as determined at pH 2.5 and at the natural reaction of 170 subjects in different parts of Sweden. Most of the subjects were ambulatory hospital cases.

The data are considered too meager to draw conclusions concerning the effect of physiological and pathological conditions upon vitamin C excretion. There appeared to be no marked variations in the vitamin C content of the urine with age nor was there any indication of a higher content in pregnancy. When the material was grouped by age and similar nutritional status, wide differences in values were found in the same groups. It is concluded that a single determination is no indication of the storage of vitamin C in an individual, and that the simplest and safest method of determining whether the storage is normal or not is to follow the output on a controlled diet over a considerable period of time.

The average value for all of the determinations reported, which were made from February to April 1935, was 9 mg per liter, with values of 5 mg for subjects in north Sweden and 11 mg in south Sweden. These values are considerably lower than those reported in the literature from other places, and are considered significant from a social hygienic aspect as pointing to a state of partial deficiency in vitamin C in Sweden, particularly in the north, during the winter months.

Diagnosis of vitamin-C subnutrition by urine analysis: Quantitative data, M. A. Abbasy, L. J. Harris, S. N. Ray, and J. R. Marrack (*Lancet* [*London*], *1935, II, No. 25, pp. 1399–1405, figs. 2*).—A further investigation of the method of determining the state of saturation of the human subject with respect to vitamin C by urine analysis (E. S. R., 73, p. 427) is reported, with definite recommendations concerning technic, interpretation of the data, and vitamin C requirements.

Determinations of the amount of trace substances other than vitamin C in the urine which react with the reagent indicated that the nonspecific reduction titer, as measured by the Van Eekelen method (E. S. R., 73, p. 428), "does not normally rise above an equivalent of about 3–6 mg per day, out of the total of 20 mg for the average 'vitamin C titer' of a 'normal' subject kept on moderately low vitamin C intake (or about 40 mg for a more liberal intake, or, say, 200 mg for the titer after a test dose, or 10 mg for a subject receiving a diet so low in vitamin C as to be approaching the border line of adequacy)."

Results are cited showing that the day by day excretion of vitamin C, the so-called "rest level", depends upon the past intake, and that the response after a test dose is graded in proportion to the resting level. In subjects with a low resting level (below 15 mg), it is suggested that the test dose be repeated on one or more further days on account of the fact that such subjects require a longer time for saturation than do those with a less advanced degree of insufficiency. A suitable test dose is 600 mg for an adult or 700 mg per 10 stone (140 lb.) body weight.

In a series of experiments in which subjects with varying subnormal reserves were given daily graded doses of orange juice as the vitamin C supplements, the subjects with initial low reserves receiving the higher doses, it was found at the end of 3 weeks that those who originally had the lowest reserves now had the highest, and vice versa. In the subjects who received 45 mg of ascorbic acid daily (about 1½ oranges) as a supplement to a diet otherwise containing little vitamin C, the daily excretion was raised to about 32 mg per day. Five subjects with initial subnormal reserves were continued on their deficient diets and given 15 mg ascorbic acid daily in the form of orange juice. In the course of 3 weeks all of the subjects reached the same level of equilibrium, excreting about 15 mg daily. The response to a single test dose of 700 mg ascorbic acid after this equilibrium had been reached was from 40 to 50 mg.

It is concluded that in adults an excretion of less than 10 mg of ascorbic acid (uncorrected) daily and failure to respond by the second day to a standard dose of 700 mg indicate a deficiency of vitamin C in the diet. Calculated on a body weight basis, the minimum and normal values for infants of about 1 stone weight were 1 and 2 mg. In a trial series of cases with infants from 1 yr. to 1 yr. 7 mo. old, receiving, in addition to their diet, a daily dose of a commercial concentrated orange juice, as recommended by the manufacturers, the excretion was never lower than the expected minimum, and the effect of test doses was well graded to the resting levels. In another series of tests in which the infants received increasing amounts of vitamin C, there was evidence of increased excretion with increased allowance. From these results and earlier results with older children, it is concluded that on a moderate allowance of vitamin C not less than 2 mg of ascorbic acid per stone of body weight is excreted. Tests carried out at random in several centers of the country showed, however, that reserves indicating suboptimum intakes are not at all uncommon.

Evidence of a lowered output of vitamin C in fever is also noted, suggesting the need for providing extra vitamin C during convalescence.

Several suggestions are given for carrying out the technic of the urine test.

A case of adult scurvy, P. Wood (*Lancet [London], 1935, II, No. 25, pp. 1405, 1406*).—The case reported is of interest in that the clinical diagnosis of scurvy was fully confirmed by the Harris and Ray method of determining the excretion of ascorbic acid in the urine (E. S. R., 73, p. 427). Simultaneous tests on the scorbutic patient and a normal control subject of the same weight gave the following results:

The ascorbic acid content of the urine 24 hr. before vitamin administration was 53 mg in the total 24-hr. sample of 1,442 cc for the control and 0 in the scorbutic patient. Similar values 24 hr. after the administration of 600 mg ascorbic acid were for the control 231 mg in a total of 1,049 cc and for the patient 1.7 mg in 1,681 cc. The patient was then treated with 80 mg of ascorbic acid in tablet form daily for a week while remaining on a diet containing no vitamin C. During this time no more ascorbic acid was excreted, but marked clinical improvement was shown. The scurvy was attributed to a restricted diet consisting almost entirely of fish, eggs, custards, milk pudding, bread, and butter.

The sequence and extent of tissue changes resulting from moderate doses of viosterol and parathyroid extract, A. F. Morgan and Z. Samisch (*Jour. Biol. Chem., 108 (1935) No. 3, pp. 741–752*).—In continuation of the study of the toxic effects of viosterol and parathyroid extract, as tested on rats (E. S. R., 72, p. 889), the time sequence of these effects upon the serum and tissues was studied as follows:

Young rats were fed a purified diet of optimum calcium and phosphorus content and ratio of 3 D and 1,500 D viosterol (8 and 4,000 international units of vitamin D daily), and after 14, 28, and 54 days groups of the animals were killed and the serum, metaphyses and shafts of femur, heart, lungs, and kidneys examined for ash, water, and fat, and the kidneys also for calcium and phosphorus. On the forty-third day additional animals were given for the remaining 11 days 3,000 D or 5,000 D viosterol or 160 to 200 units of parathyroid extract.

In comparison with the rats receiving 3 D viosterol, those receiving 1,500 D grew less after the twenty-eighth day and had a less marked increase in ash and decrease in water content of the shafts and metaphyses of the femur, a higher fat content of the bones, and an increased water and ash content of the kidneys. At all times the serum calcium and inorganic phosphorus were higher.

All but one of the parathyroid-treated and 3,000 D and 5,000 D groups lost weight. The animals on the higher viosterol dosages had a less marked increase in ash and decrease in water content of the shafts and metaphyses of the femurs than those in the 1,500 D group, but the results on the bones of the animals receiving parathyroid were less consistent. Extraordinary amounts of ash were found in the kidneys of the parathyroid-treated animals. The increase in phosphorus corresponded with the total ash, but that in calcium was somewhat lower.

The authors conclude that "vitamin D and the parathyroid hormone are not identical in their action, and that a factor specifically affecting renal tissue may be present in the parathyroid extract."

The extractability of vitamin G (B_2) from yeast by various acetone-water and methyl alcohol-water mixtures, P. L. Day (*Jour. Amer. Chem. Soc., 56 (1934), No. 2, pp. 452–454, figs. 2*).—"Dried baker's yeast was subjected to extraction with various acetone-water and methyl alcohol-water mixtures. The vitamin G contents of the untreated yeast, the yeast residues, and the yeast extracts were determined by feeding experiments." Acetone at concentrations of 99.5 and 80 percent (by weight) did not extract appreciable amounts of vitamin G from the yeast, but at 60 percent about half of the vitamin was extracted. Absolute methyl alcohol likewise did not extract appreciable amounts of the vitamin, but 80 percent methyl alcohol extracted about one-fifth and 60 percent approximately half of the vitamin.

"The growth-promoting properties of the various yeast residues and extracts were similar to their cataract-preventive properties. Those yeast preparations that promoted growth in experimental animals prevented the development of cataract, while cataract appeared in animals receiving preparations that did not promote growth."

Enzymatic efficiency in avitaminosis, I, II, B. Sure, M. C. Kik, and K. S. Buchanan (*Jour. Biol. Chem., 108 (1935), No. 1, pp. 19–33*).—Two papers are presented.

I. *Influence of vitamin B deficiency on tryptic and ereptic digestion of casein* (pp. 19–26).—Data, obtained by the method noted on page 743, are reported from rat experiments showing that no disturbance in tryptic or ereptic digestion of casein, as evidenced by the Willstätter alkalimetric titration method and the Van Slyke gasometric amino nitrogen method, takes place in deficiency of vitamin B (B_1) or the vitamin B complex.

II. *Influence of vitamin B deficiency on efficiency of pancreatic lipase and esterase* (pp. 27–33).—In this study, in which the authors had the technical assistance of J. DeWitt, the effect of a deficiency of vitamin B (B_1) or the vitamin B complex on the efficiency of pancreatic lipase and esterase was determined, with results indicating that a deficiency of the vitamin B complex produced a marked reduction in the efficiency of digestion of both of these enzymes. A similar decrease in pancreatic lipase activity was demonstrated in vitamin B (B_1) deficiency. The work on pancreatic esterase efficiency has not been completed.

These enzymatic disturbances are considered to be due solely to the vitamin deficiency, since the amount of food intake and the plane of nutrition were controlled.

The child's heart in avitaminosis, I. A. Abt (*Amer. Jour. Diseases Children, 50 (1935), No. 2, pp. 455–471*).—This is a review and discussion of the literature dealing with cardiac changes, principally hypertrophy and dilation, in infantile beriberi, scurvy, and rickets. A list of 48 references to the literature is given as footnotes.

Elimination diets for children, C. B. P. Cobb (*Amer. Jour. Diseases Children, 50 (1935), No. 1, pp. 187–211*).—Following a brief discussion of allergy and of procedures to be followed by the physician in the selection of appropriate trial elimination diets for children, a series of seven type diets is presented in detail.

Allergic eczema: Eczema initiated by sensitization to foods, J. G. Hopkins and B. M. Kesten (*Amer. Jour. Diseases Children, 49 (1935), No. 6, pp. 1511–1530, figs. 2*).—Among about 400 cases of eczematous eruption studied in the allergy division of a dermatologic clinic in the past 6 yr., 75 were found in which the evidence seemed definite that food was either the sole or a contributing cause of the dermatosis. "Sensitization was found most frequently to foods usually eaten within the first year of life. Egg caused outbreaks of eczema in nearly one-half the patients and milk or wheat in about one-fourth. Orange, spinach, potato, oat, and cod caused eczema more frequently than the remaining foods tested."

In the majority of infants and young children showing this type of eczema, sensitization to foods appeared to be the sole cause, but in most of the older patients other factors seemed to be involved. The sequence of sensitization is suggested to be as follows:

Eczema of this type usually begins as an allergic reaction to one or more foods in infancy. With increased age and greater complexity of the diet, sensitization to more and more articles of food takes place, with the original sensitization still persisting or being lost as new ones are acquired. These may be not only to foods but also to fabrics, epidermal substances, bacteria, and fungi. The manifestation of allergy also may change with age, usually beginning with gastro-intestinal lesions, followed by typical eczema, urticaria, asthma, and hay fever.

Sensitivity to ingested yeast, J. B. Biederman (*Jour. Amer. Med. Assoc., 106 (1936), No. 1, pp. 31, 32*).—Three case reports are given showing allergic reaction to ingested yeast. One of the patients was formerly able to tolerate the amount of yeast used in cooking but was later unable to use the same amount after taking for a short time a nationally advertised yeast. It is suggested that yeast be included in making routine skin tests.

Endogenous factors in the control and arrest of dental caries, C. L. Drain and J. D. Boyd (*Jour. Amer. Dietet. Assoc., 10 (1935), No. 6, pp. 471–475*).—The authors summarize briefly their observations on the arrest and control of dental caries in the Children's Hospital dental clinic at the University of Iowa, leading to the conclusion that "endogenous factors must be considered as basic in the control of dental caries, that adequate diet is the most efficient means at hand, and that the entire diet should receive attention. . . . It is our belief that the integrity of the tooth is dependent upon the adequacy of the diet in all respects, and that probably the health of the tooth can be impaired through the inadequacy of any one of several essentials. We should treat, not the tooth, but the child, and direct our attention toward the health of the individual as a whole."

Results of goiter prophylaxis with iodized salt, J. F. McClendon (*Science, 81 (1935), No. 2103, p. 381*).—In this brief note the author reports on the remarkable results obtained in goiter prophylaxis in Switzerland during the past 11 yr. in which iodized salt has been used, and quotes a letter from H. Eggenberger, giving the conclusions presented at the Second International Goiter Congress at Bern, Switzerland, in 1933. According to Eggenberger, the danger of goiter in man exists if the average daily intake of iodine is under 1γ per kilogram of body weight. If the average intake is 2γ, there is no danger of goiter even with increased susceptibility as the result of infectious disease or high fat or high cabbage diet. Goiter can easily be avoided with the daily use of salt containing 1 part of iodine in 100,000 parts.

Human calorimetry.—I, A semi-automatic respiration calorimeter, J. R. Murlin and A. C. Burton (*Jour. Nutr., 9 (1935), No. 2, pp. 233–260, figs. 9*).—

"A respiration calorimeter is described in which the measurement of direct heat has many automatic features. The respiration chamber is a cylinder of Pyrex glass through which air circulates in a closed circuit, including two interchangeable Benedict trains of absorbers. Oxygen is admitted automatically as it is consumed and is measured on a wet test meter. Cold water, brought initially to a constant temperature, passes through a grid of Pyrex tubes to carry away most of the heat. The temperatures of inflowing and outflowing water and air and the temperature of the glass wall are electrically measured and automatically recorded every minute. Water flow and air flow are recorded by meters of special design. . . .

"In a series of alcohol checks, the totals of direct and indirect heats differ by 0.17 percent, while the average difference in individual hour periods is 2.9 percent. In human calorimetry, the average difference is more, but by the use of rectal and surface temperatures measured by resistance thermometers it has been brought to 5.5 percent."

HOME MANAGEMENT AND EQUIPMENT

[Home management studies at the Cornell Experiment Station] (*N. Y. State Col. Home Econ., Cornell Univ., Ann. Rpt., 10 (1935), pp. 29, 30*).—Brief summaries are given of studies by H. Canon and A. Hotchkiss of the food purchased and produced for home use by 291 farm families in Livingston County, N. Y., by D. Monroe and L. Doman of three types of variations in prices charged by retailers for grocery products, and by D. Wiesendanger on consideration of the needs of children in selecting household furnishings.

MISCELLANEOUS

Forty-seventh Annual Report [of Arkansas Station], 1935, C. O. Brannen (*Arkansas Sta. Bul. 323 (1935), pp. 55, figs. 4*).—The experimental work not previously abstracted is for the most part noted elsewhere in this issue.

Forty-eighth Annual Report [of Cornell Station], 1935, C. E. Ladd et al. (*[New York] Cornell Sta. Rpt. 1935, pp. 160*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Fifty-fourth Annual Report of the New York State Agricultural Experiment Station, [1935], U. P. Hedrick (*New York State Sta. Rpt. 1935, pp. 95*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Reports on the work of agricultural research institutes and on certain other agricultural investigations in the United Kingdom, 1933–1934 (*[Gt. Brit.] Min. Agr. and Fisheries, Rpts. Agr. Res. Insts. [etc.], 1933–34, pp. 351*).—This material, continuing that previously noted (E. S. R., 72, p. 735), is discussed editorially on page 737.

NOTES

Connecticut [New Haven] Station.—Dr. Lafayette B. Mendel, research associate in biochemistry in the station since 1931, Sterling professor of physiological chemistry in Yale University, and a recognized authority on nutrition, died December 9, 1935, at the age of 63 years. His academic training was received at Yale, and he was a member of its staff continuously from 1892. In addition to making many contributions to physiological chemistry in conjunction with Drs. Chittenden and Osborne and independently on proteins, vitamins, growth, and other subjects, he had large influence in training research workers, as an adviser to the U. S. Department of Agriculture and many scientific organizations and other groups, and as the author of Nutrition: The Chemistry of Life (1923) and about 300 research papers.

Mississippi College and Station.—Funds were provided by the last legislature for a new veterinary science building to be used for teaching and research. The appropriation for the station for the ensuing biennium was maintained without change.

Montana Station.—Mitrofan Afanasiev, in charge of the field plant pathology laboratory of the University of Nebraska at Alliance, has been appointed assistant bacteriologist and botanist and has entered upon his duties.

Nevada University and Station.—*Economic Talks With Farmers* is being published monthly by the department of farm development of the station and the economics section of the extension service. The initial number contained a brief discussion of the agricultural outlook for 1936. Future numbers will also contain outlook material, as well as results of cost studies on private farms, economic interpretations of experiments conducted by the station, and such other economic data as will from time to time be available.

The station has been notified that the publications submitted by it to the Exposicion Americana de Publicaciones Agricolas, Instituto de Ingenieros Agronomos, recently held at Santiago, Chile, have been awarded a first prize.

New Jersey Stations.—Fire that wrecked the interior of the soils house on April 1 destroyed more than 2,000 crop samples, some dating back to 1898.

New Mexico Station.—Work was begun May 14 on a home economics building.

New York State Station.—The retirement on July 1 with the title of professor emeritus of botany in Cornell University is announced of F. C. Stewart, head of the division of botany since its establishment in 1898 and mycologist for the 4 years previous. Under his supervision the division, recently rechristened the division of plant pathology, has grown to include a scientific staff of 11 members. His personal contributions have covered a wide range, notably with potato diseases and their control, mushrooms, and popcorn, and have resulted in nearly 200 articles. Following his retirement, he expects to continue his studies of wild mushrooms and other large fungi, particularly those growing in the Adirondack Mountains. He will be succeeded by Dr. Otto A. Reinking, at present consulting plant pathologist for the United Fruit Company.

A new research division to be known as the division of seed investigations has been set up with M. T. Munn in charge. The new division will handle the official seed inspection and will conduct researches into the physiology of germination, various phases of the problem of seed-borne diseases, and other investigations pertaining to seeds.

A recent grant from the Rockefeller Foundation is making possible the utilization of X-rays in a study of the mechanics of chromosomes as part of the station fruit breeding investigations. The X-rays are used as ultra fine dissecting instruments in an effort to divide the chromosomes longitudinally at a stage in their development where ordinary light rays are too coarse to show a longitudinal subdivision of the chromosome thread.

The station, cooperating with the New York Botanic Garden, announces the development of a new seedless grape, which has been named Bronx Seedless. The new variety represents 16 years of effort to obtain a seedless grape hardy under New York conditions.

North Dakota Station.—Dr. Charles E. Mangels, cereal chemist since 1921, died April 23 at the age of 44 years. He was a native of Missouri, receiving the B. S. degree from the university in 1914 and the M. A. degree in 1916, and had also been granted the Ph. D. degree in 1932 from the University of Minnesota. He had served in the Missouri and Ohio Stations and the University of Missouri and was chemist in charge of the dehydration laboratory of the U. S. D. A. Bureau of Chemistry from 1918 to 1921. He was well known for his many contributions on the flour-yielding capacities of wheats, milling and baking investigations, and other studies in cereal chemistry, and had recently served as president of the American Association of Cereal Chemists.

Oklahoma College and Station.—Dr. William A. Craft, associate professor of animal husbandry and associate animal husbandman, has been appointed chief of swine investigations in the U. S. D. A. Bureau of Animal Industry.

Pennsylvania Station.—A dinner attended by most members of the staff was given May 18 in honor of W. H. Beal, associate in experiment station administration and now completing his forty-fifth year in the service of the U. S. D. A. Office of Experiment Stations.

Puerto Rico Federal Station.—A 3-day excursion to Hispaniola was recently arranged by the station on an unofficial basis and participated in by 25 members of the staff and representatives of the U. S. D. A. Bureaus of Entomology and Plant Quarantine, Chemistry and Soils, and Agricultural Economics. The party was received by Governor Francisco Cordero at the port of San Pedro de Macorís and by the Secretary of Agriculture, Commerce, and Industry of the Dominican Republic and extended many courtesies. Opportunity was afforded to study the soils, plant life, and insects of the island, and the trip was considered highly profitable.

Rhode Island Station.—Samuel Chester Damon, assistant in field experiments from 1907 to his retirement in 1934, died in Kingston March 12 at the age of 79 years. He was a native of Massachusetts, graduating from the Massachusetts College in 1882 and serving from 1895 to 1907 as trustee. His services on the field plats of the station were important and highly regarded, being characterized to an unusual degree by scientific appreciation.

Virginia College and Station.—Dr. Nicholas A. Pettinger, assistant professor of agronomy and associate agronomist since 1927, died February 1 at the age of 34 years. Dr. Pettinger was a native of Iowa and graduated from the Iowa College in 1923. Subsequently he received the M. S. and Ph. D. degrees from the University of Illinois. From 1924 to 1926 he was associated with the Illinois Station as assistant in crop production and plant breeding. Much of his research work in Virginia had been with fertilizers and plant deficiency symptoms, especially in the development of chemical methods for the diagnosis of fertility needs.

Recent appointments include the following assistants in the station: James H. Lillard in agricultural engineering; James A. Cox, assistant in research (entomology) in the New York State Station, in entomology; and Dr. J. A. Pinckard in plant pathology.

Washington Station.—A laboratory for research on new products and byproducts from fruits and vegetables has been established by the U. S. Department of Agriculture in cooperation with the station. This laboratory will be under the direction of H. C. Diehl, senior physiologist of the Bureau of Chemistry and Soils and in charge of the frozen pack laboratory at Seattle, and under the immediate supervision and management of H. H. Mottern, chemist of that Bureau, who has been transferred to Pullman. Otto Johnson, assistant chemist in the station, will henceforth devote his entire time to the work of this laboratory.

J. William Cook has been appointed assistant in the division of chemistry for analytical work.

West Virginia University and Station.—Under a cooperative agreement with the New York State College of Forestry at Syracuse University, involving a collection of herbarium material of various West Virginia tree species, the university has been chosen as one of 12 depositories for a set of herbarium specimens valued at about $2,000. This material is comprised of authentic wood samples and mounted tree foliage, flowers, and fruits of several hundred tree species of the United States. Dr. L. S. Bennett, assistant agronomist, has resigned to become associate geneticist in the Arkansas University and Station.

Wisconsin University.—Magnus Swenson, chemist for the experimental farm of the university in 1881 and 1882, during which time he carried on pioneer work on amber cane for sugar and sirup and the ensiling of fodders, died March 29. From 1905 to 1915 he also served as trustee of the university. In 1912 he was knighted by the King of Norway and presented with a decoration for conspicuous achievement in the field of science.

Necrology.—Dr. Albert Spear Hitchcock, associated with the U. S. D. A. Bureau of Plant Industry since 1901 and characterized by *Nature* as the world's foremost agrostologist, died at sea December 16, 1935, while returning to this country from a European trip undertaken in connection with the Sixth International Botanical Congress. Dr. Hitchcock was borne in Owosso, Mich., September 4, 1865, and obtained his college education at the Iowa College, receiving the B. S. A., M. S. A., and Sc. D. degrees in 1884, 1886, and 1920. He taught chemistry in the University of Iowa from 1885 to 1889, served as an assistant in the Missouri Botanical Gardens for 3 years, and was professor of botany and botanist in the Kansas College and Station from 1892 to 1901. He specialized in taxonomy and had collected plants in every State of this country, as well as in Canada, Alaska, Mexico, and the West Indies, and had conducted explorations in South America, Hawaii, the Philippines, and Asia. Under his direction the grass herbarium of the Department became the most complete of any in the world. He was the author of many publications, notably the comprehensive Manual of the Grasses of the United States published in 1935. A manual of the grasses of the West Indies had also been completed, and he had been at work on the genera of the grasses of the world.

Dr. Elwood Mead, organizer of the irrigation and drainage investigations of the U. S. Department of Agriculture and head of this work in the Office of Experiment Stations from 1897 to 1907 and since 1924 Commissioner of the Bureau of Reclamation of the U. S. Department of the Interior, died January

26 at the age of 80 years. He had also held professorships in the Colorado College and the University of California, and had been State engineer of Wyoming, chairman of the State Land Settlement Board of California, and chairman of the State Water Commission of Victoria, Australia. In these and other capacities he rendered a noteworthy pioneer service as educator, engineer, organizer, and administrator. He formulated a system of laws governing the use of water which in principle was adopted by many States and foreign countries. As an administrator he was a man of vision, courage, and sympathetic understanding. In the words of Hon. Paul R. Greever of Wyoming "those of us in Congress from the Western States feel that the passing of Dr. Mead is an irreparable loss. There was perhaps no man in the country who had as thorough an understanding of the problems of irrigation and reclamation."

Dr. Kary C. Davis, professor of agricultural education in the Knapp School of Country Life at George Peabody College for Teachers since 1913, died March 5 at the age of 68 years. Dr. Davis was born in Illinois, and received the B. S. and M. S. degrees from the Kansas College in 1891 and 1894 and the Ph. D. degree from Cornell University in 1900. He had held a number of teaching positions, including the professorship of horticulture in the West Virginia University in 1901–2 and the professorship of agronomy and principal of agricultural short courses in Rutgers College from 1908 to 1913, but perhaps was most widely known as the author of a considerable number of textbooks and other manuals of wide circulation.

Weather and Crop Forecasting.—The Secretary of Agriculture has announced that the scientific soundness of various methods of making long-range weather forecasts is to be studied by the U. S. Department of Agriculture as a Bankhead-Jones project. A survey of attempts at such forecasting in this and other countries is now under way as a W. P. A. project to give a basis for future research by the Department. From a second survey on the relationship of weather to crop yields, as revealed by studies already made by the Weather Bureau, the Bureau of Agricultural Economics, and various State institutions, the Department expects to develop more intensively the research in crop yield variations and weather factors.

The U. S. D. A. Bureau of Agricultural Economics announces completion of organization in its Division of Crop and Livestock Estimates of a research project "for the purpose of discovering fundamental principles for use in the regular research work of the division" and involving long-range weather and crop forecasting. The project will be in charge of Dr. Charles F. Sarle, principal agricultural economist (research) and a staff of statisticians and meteorologists operating at Washington and at various places in the field. A feature of the project will be a historical survey of previous work done on long-range weather forecasting.

An improved freeze and frost forecasting service for Florida has been organized by the U. S. Weather Bureau, cooperating with the Florida Experiment Station, with a Congressional appropriation of $15,000 and a State appropriation of $10,000 per year. The service has headquarters at Lakeland, with four or five meteorologists located at other strategic points in the fruit and vegetable sections of the State. Provision has been made for the widest possible distribution of the forecast and for professional advice and service to the growers themselves.

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